# QST

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devoted entirely to

# amateur radio



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# QST *devoted entirely to*

# AMATEUR RADIO

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## Section Communications Managers of the A.R.R.L. Communications Department

**Reports Invited.** All amateurs, especially League members, are invited to report communications activities, training plans, code classes, theory-discussion groups, civilian-defense building or planning each mid-month (16th of the month for the last 30 days) direct to the SCM, the administrative official of ARRL elected by members in each Section whose address is given below. Radio Club reports and Emergency Coördinator reports representing community organized work and plans and progress are especially desired by SCMs for inclusion in *QST*. **ARRL Field Organization appointments,** with the exception of the Emergency Coördinator and Emergency Corps posts, are suspended for the present and no new appointments or cancellations, with the exception named, will be made. This is to permit full efforts of all in Emergency Corps plans.

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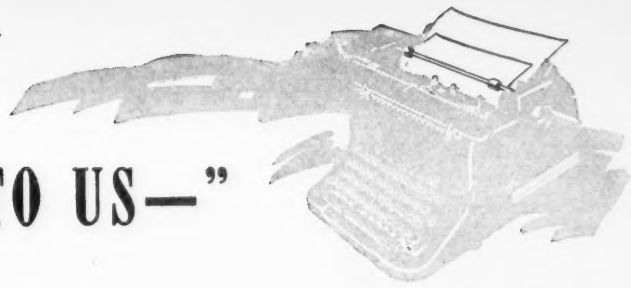

# "IT SEEMS TO US—"

**KEEP UP W.E.R.S.!**

WE PLEAD for a continuation of active amateur participation in the War Emergency Radio Service, as something very much in our own interests as amateurs as well as a national aid. It is not that we see signs of letting down in WERS — we admit that there are no such indications; it is just that we fear it may come as part of a general slackening off of civilian-defense activities, and we feel that it would be a serious mistake. We'll give some reasons:

1) We figure there still are excellent possibilities of some sneak air attacks.

2) WERS has the even larger duty of being prepared to deal with natural disasters, which are likely to come to any community and certain to come to some.

3) Although WERS is not an amateur service, it is a simple fact that it is largely manned and directed by amateurs and hence is commonly thought of as one of the jobs amateurs are doing. If we do it well, it will be to our credit as an organized group. If we lie down on the job and quit too soon, the opposite will be the case.

4) As long as WERS lives, those frequency bands are held for a service in which we can participate, with a watchful eye for our own interests. Should the service be abandoned the frequencies will be assigned elsewhere and we could well have trouble holding title to the bands until we get them back after the war. This factor alone is sufficiently important to warrant every available home-front amateur in getting into WERS and helping to hold the line.

5) Finally we would mention the operating pleasure to be had from WERS. Really, fellows. It sounds pretty small-time, we know, and perhaps it's a measure of how hungry we are for operating, but we have got a great boot out of the activities from the outlying hole-in-the-wall where we are Chief Operator, working over the magnificent distance of a mile and a half to Control at Town Hall, with the terrific power of three or four watts. There has been drill in the skillful voice-handling of incident reports and the resulting message traffic. We have a certain pride in the fact that our station is the only one in the net, except for Control, that has never missed a test, and we like to think that we are the fastest and the snappiest on the come-back. There have been miniature engineering problems, too. We remember our typical amateur glow when we participated in putting an extra $2 \times 4$ in the mast and adding a reflector behind the antenna, thereby getting solid communication with Control over an intervening rise, and the best reception in town. We are the maintenance engineer for three power supplies — interior dry batteries, external 115-volt a.c., and 6-volt vibrator — and we have achieved such operating excellence that we can test and get reports on all three in an elapsed time of one minute. At present the technical talent at our station is being directed at the problem of matching in a "salvaged" handset so that the auxiliary fire and police forces we serve can more conveniently talk to Control when necessary. And such surroundings as we have at our QTH! Our walls are of bright yellow tile. Our operating table is a snappy affair of black enamel and bent chromium tubing, with a special shelf for the log. We sit on a modernistic contraption of chartreuse leather and some more of the tubing. The off-duty operator lounges in a sort of steamer chair which is an unholy fire-department red. For official visitors we have two small stools of black and more chromium. We have an ash stand, black-out panels, heat, three lighting fixtures, and — thank God — air conditioning. The mere fact that all this glory happens to serve also (but at other times) as the ladies' powder room in a neighborhood gasoline filling station detracts not one whit from our feeling of magnificence as we sit there, monarch of all we survey, engineering problems licked, feeling competent to deal with any situation that may arise. Yes, WERS operating is decidedly fun.

Incidentally, George Hart has just written a new League publication, *A Manual for the War Emergency Radio Service*, which you should find a practical and useful guide in expediting WERS organization in your community. It is available without charge to ARRL members engaged in WERS work.

Possibly you'll hear rumors that OCD is going to fold. It probably will some day, you know, though not soon. But it seems to us that even if the formal civilian-defense organization should be abandoned and wholly disbanded, it is our duty as amateurs to continue WERS right on through the war. It can be done, since the licensing arrangement is between the

local government and FCC. There is no other way that our home communities can have disaster communication service until we get back on the air as amateurs. So let's continue to give WERS our best!

### SHORT WAVES FOR SHORT DISTANCES

ALL OF which reminds us of something we have been meaning to mention on this page: We are now of the definite conviction that every postwar amateur station must be equipped with v.h.f. apparatus for local work.

It will be a practical necessity. We're going to be crowded after the war, since we must expect great growth in our ranks as a result of wartime radio training. Can you remember hearing four or five 500-watt 'phones in the same town talking to each other on 3950 by the hour? Have you ever talked to a local a few blocks away on your 40-meter ground wave while every ham from Cairo, Illinois, to Cairo, Egypt, softly but purposefully swore at you? We never should have done such things and we're persuaded that we shall not be able to afford to do them after the war. We must make a more effective use of our frequencies, do a more sensible job of using each band for its best purpose, or there won't be enough to go around. One rule that we must adopt, it seems to us, is that short-range work shall be done only on bands not useful for longer distances.

This means, in our estimation, that every amateur ought to begin planning now to have an auxiliary rig on 5 or 2½ or less, which he will use for all communication at less than some minimum distance, such as fifteen or twenty miles, which we can quickly establish by experience after the war and which, we believe, will quickly become a matter of good operating practice having the force of an unwritten law. WERS has shown many of us what only a few of us properly realized before, that it is readily possible to have solid local coverage on v.h.f. with low power and simple equipment. It needn't be expensive if you're not interested in v.h.f. DX. And if you're c.w. and dislike 'phone, good c.w. can be had easily enough in the 5-meter band, while the higher frequency ones will yield readily to i.c.w. It is also in this same field of local work that we will be doing most of our experimenting with the ultrahighs and superhighs, where neat little directional antennas of enormous gain will simplify the QRM problem and where we can look forward to plenty of fun with Plumber's Delights as war secrets unfold.

So start thinking now, OMs and YLs, about that little second rig you're going to have somewhere above 56 Mc. for short-range work, so that our longer-distance frequencies may be spared that burden and used more effectively. In our belief, it will be essential.

K. B. W.

## ★ SPLATTER ★

### OUR COVER

ILLUMINED only by lambent streamers of aurora, the five tower antennas of an AACS simultaneous radio range stand in bleak grandeur on the drifted snows through the winter-long Arctic night — a guidepost of the military skyways along the North Atlantic route. (An official U. S. AAF photograph.)

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### FOOTNOTES

THE fact that three out of four of the new non-staff contributors to this issue are or were commercial operators or engineers is purely coincidental and is not to be held against them. They all began the right way — as hams.

Presenting first the team of Bartlett and Burns (p. 45): **Forrest A. Bartlett, W6OWP,** confides that his interest in radio dates back to grade-school days of 1923 or 1924, when he used to worry his parents by staying up late nights listening for "DX" — which meant any station more than thirty miles from Boulder, Colo. In 1930 he was licensed as W9FYK, and he held that call during his college years at the University of Colorado Engineering School. His present call, W6OWP, was issued in 1938. He was married in 1935. His wife is now a ham — W6SXG — and four-year-old Forrest, jr., shows promise of being an op some day. From 1935 to 1937 he worked in broadcast stations from Denver to Oregon and south to Los Angeles. Communications, however, held more interest than the broadcast game, and from 1937 on he worked at both operating and technical posts in that field. Now he is employed as a receiving engineer for Press Wireless. Although the earlier years of his career in radio necessitated a number of long-distance moves, a portable rig of some sort always managed to be tucked somewhere in his belongings. He remembers during the DX contest of 1936 the difficulty of explaining a Marshfield, Ore., QRA and a W9FYK/7 call. **Arthur Burns,** collaborator on the Wheatstone keyer article, has been in radio work for fifteen years. Starting his career in St. Louis, Mo., he came to Los Angeles in 1938. He now heads the service department of a leading electrical goods concern. An experimenter at heart, he has spent considerable time in the development of specialized test equipment and electronic remote control devices. More recently he has widened the scope of his research activities to include apparatus in the communications field. He is 30 years old, married and the proud father of two young daughters.

*(Continued on page 106)*

# The Army Airways Communications System

## *Part I—What the AACS Is and What It Does*

BY CLINTON B. DESOTO,* WICBD

In 1939, with Europe at war and the growing prospect of eventual U. S. participation on a global scale, the Army Airways Communications System was given the assignment of creating and operating communication facilities and radio navigational aids along our military airways wherever they might go. At that time AACS personnel consisted of four officers and 350 enlisted men, operating a few ground stations at major bases in continental U. S. A.

By the end of 1943 the total personnel numbered well up into five figures and AACS had become the largest communications system, military or commercial, the world has ever known — operating over some 600,000 circuit miles, with stations in each of the 48 states and in 52 foreign countries, supplying communications for more than 100,000 miles of airways throughout the world.

This prodigious expansion, accomplished despite overwhelming handicaps and in the face of intense competitive pressure for personnel and matériel, is one of the major organizational and technical achievements of this war.

That fact alone would make AACS a subject of interest to readers of *QST*. Even more significant, however, is that many of the men responsible for building this monumental military structure were radio amateurs.

AACS began with a small cadre of experienced Army men — actually, the personnel of four Air Forces squadrons — leavened by a few skilled amateurs, who became the backbone of the organization. Around this nucleus were gathered hundreds of other picked amateurs. These men now largely command and operate the system. Of the operating and technical staff officers at AACS Wing Headquarters in Asheville, N. C., some 90 per cent came from ham ranks. At least 20 of the 23 AACS regional commanders were active amateurs before entering military service. From the commanding officer on down, the bulk of AACS personnel is composed of men who acquired skill and training for their present posts through amateur radio.

That aspect will be explored in more detail in the second part of this article. First, however, to appreciate the significance of this achievement, it is necessary to have an understanding of the nature and functions of AACS.

Despite its scope and importance, AACS is perhaps the least-known of the varied branches of our complex military machine. This has been the result partly of a lack of self-exploitation on the part of the System itself, but even more it has been the result of restrictions imposed by considerations of military security.

Now that the tide of war on all fronts is turning in favor of the Allied nations, however, these restrictions have been partially relaxed. As a result, *QST* is now privileged to present this account of AACS activities and operation.

### *AACS Links the Airways*

The story of AACS is the story of America's growing military air transport and combat power. Its expansion has been a prelude to the expansion of America's global war effort.

One way of describing the AACS is as the international equivalent of the domestic radio and wire network of the CAA. It is the transmission agency which conveys all the information — operational traffic, weather data, flight control instructions and radio navigational aids — needed for the movement of aircraft along the roadways of the sky.

Actually, of course, an airway is not a roadway in the strict sense of the word. It is, rather, a series of landing fields along the routes which airplanes must fly to fulfill their missions. The function of AACS is to guide aircraft safely on the aerial paths connecting these fields.

But that is only one function of AACS. Another is to provide point-to-point circuits for the trans-

* Editor, *QST*.

**At some future date, when all the accounts are balanced and the sum total is set down on the ledger, among amateur radio's wartime credits there will be one for having been, in large measure, responsible for the successful creation of the world's largest military communications network — the Army Airways Communications System. For the AACS is, to as great an extent as any military organization could be, a product of amateur resourcefulness, energy, skill and determination.**

**To tell in full detail of the development of AACS could not be done in less than full book length. Obviously, such a report is beyond the scope of *QST*. Yet it seems desirable not only to establish the record of AACS accomplishment — and in particular the part played by radio amateurs — but to describe its operations. In consequence, this story is being presented in two parts — the first, in this issue, a condensed, unadorned, factual statement of what AACS is and does; the second, to appear in March *QST*, a narrative account of the development of the System and the part played by radio amateurs.**

Far North

**AACS stations around the world. The globe-girdling scope of AACS operations is illustrated by the photographs on these pages, showing typical AACS communications stations in the Frozen North, in the heart of Africa, in China and in India.**

*Official AAF photographs.*

mission of all other forms of intelligence necessary to aircraft operations.

To provide these services AACS has established radio and wire services with a total circuit mileage equivalent to nearly 25 times the distance around the globe. It has established communications stations throughout the world (the enemy permitting) wherever U. S. military aircraft must fly.

These stations vary widely in size and importance. A small fixed station at an isolated weather reporting post may have only a single 200-watt transmitter and a crew of two or four men. The larger stations on the main foreign transport routes are elaborate installations staffed by a hundred or more men and having, in addition to the main control room and the transmitter and receiver plants, a message center for routing incoming and outgoing traffic and a cryptographic section for coding and decoding messages. In addition to these point-to-point facilities there will be a control tower, a radio range system, a homing transmitter, a direction-finding station or beacon, and perhaps an instrument-landing installation.

The facilities provided divide into three major categories: (1) point-to-point, (2) weather, and (3) flight control and navigational aids.

### *Girdling the Globe Point-to-Point*

The point-to-point services of AACS constitute a gigantic world-wide radiotelegraph system involving about 600 stations averaging around 5000 contacts per hour. Three modes of transmission are employed — manual, high-speed automatic, and radioteletype. While the constantly increasing volume and the demand for speed with the accelerating tempo of global war has resulted in a decided trend toward automatic operation, the manual circuits still remain the backbone of the system.

At each airways station there is set up a communications center, comprising the entire point-to-point installation at the base. This center contains four separate sections: (1) the message center; (2) the cryptographic section; (3) the teletype transmission agency, and (4) the radio transmission agency.

Incoming messages are filed at the message center, where they are receipted for, classified as to priority, assigned routings, and cleared through to the cryptographic section.

Because of security requirements, practically every message transmitted by AACS is coded before it is sent over the air. The nature of the code used depends on the character and classification of the message. Both coding and decoding are done by carefully selected personnel who are rigidly investigated for loyalty and trustworthiness.

Properly encoded, utilizing the most advanced and secret cryptographic devices employed by the U. S. Army, messages go to the various operating positions in the control room — in the usual cipher message form if they are to be sent manually, or on perforated tape for automatic transmission.

Traffic for an active war theater where the volume is too heavy for a manual circuit is handled over a high-speed automatic circuit. In this system a message, punched out on perforated tape, is fed to an automatic transmitting head which keys the transmitter at speeds up to 250 words per minute. At the receiving end a magnetic recorder inscribes inked "slip" which is, of course, transcribed by the receiving operator on an ordinary typewriter.

The radioteletype is used on circuits handling an exceptionally large volume of traffic. This is a combination of a radio circuit and the conventional land-line teletype system used by news services, branch offices, etc. — with a frequency-modulated r.f. carrier wave replacing the wire line. A plain-language message transmitted by radioteletype is simply "typed" out on the standard teletype keyboard and transmitted directly. Coded messages, however, are prepared on perforated tape by a mechanical encoding device and then transmitted by an automatic keying head at perhaps 60 w.p.m. At the receiving point plain-language transmissions are transcribed directly as page-size copy on a teletype printer, while coded traffic is tape-recorded for decoding by a similar mechanical device employed as a printer.

The necessity for providing fast and accurate communications for the movement of aircraft has resulted in making AACS what is believed to be the fastest point-to-point communications system in existence. The average time required for the receipt, encoding and transmission of a typical message is less than 15 minutes.

Africa

### *Tomorrow's Weather Today*

The second important AACS activity is the transmission of weather data. A striking commentary on the global extent of U. S. military activities is to be found in the fact that the AACS is now one of the world's largest agencies for the collection and distribution of weather information in foreign areas. The necessity for such extensive coverage arises from the fact that the weather on any aerial route may be "made" at locations thousands of miles distant from the actual route. Data acquired by scheduled observations at widely scattered weather observation posts, some of them at isolated locations hundreds of miles from the main routes, are transmitted by AACS stations at these posts to key collection and distribution centers as well as to Weather Central in Washington. From these data the weather charting and analyzing stations make future weather predictions which are available to military and civil agencies of all Allied nations. Many agencies contribute in the gathering of these data.

Use is made of the point-to-point and air-ground facilities of AACS as well as a number of specialized weather communications services. Speed in transmission is an essential factor, for weather is a highly perishable product and local data only a few hours old may be relatively useless. All weather data is transmitted in code, of course — that which is broadcast for general use by aircraft in flight being in simple codes readily translated by pilots and navigators.

The AACS and the Army Air Force Weather Wing work in close liaison — so closely, in fact, that the headquarters for both wings are located in the same building in Asheville. At every Army Air Base the units from each wing work together as a team. The weathermen make the observations and turn their reports over to AACS for transmission. This applies even to the most remote outlying posts, where the units consist of only one man from each service — a weatherman and a radio operator. On occasion, especially in the smaller units, a member of one unit may have to substitute for the other.

There are two inviolable rules: (a) the data must be obtained, and (b) it must be got through. For everything depends on having complete weather data. Accurate meteorological forecasts cannot be made with weather maps having substantial gaps — or even one gap — in the observations. All weather observation points are located at critical points chosen with great care, and all are vital. A missing report might fail to disclose a weather condition which could result in the loss of a flight of fifty bombers, particularly in Arctic territory. That must not happen — and it is AACS's proud boast that it doesn't.

### *Signposts of the Sky*

Interlaced with the world-wide point-to-point AACS networks are the radio navigational aids, described as "the equivalent of the lighthouses of the sea lanes, plus the rails, the roads, and the manifold landmarks of surface navigation."


AACS operators are the traffic cops and radio highway patrolmen of the airways — operating the "stop-and-go" signals at the airports, posting the aerial highways with signposts in the form of radio beams and markers, supplying highway information in the form of data on weather and other conditions. The flight control and radio navigational facilities provided are used by the air transport organizations of all U. S. and Allied armed forces.

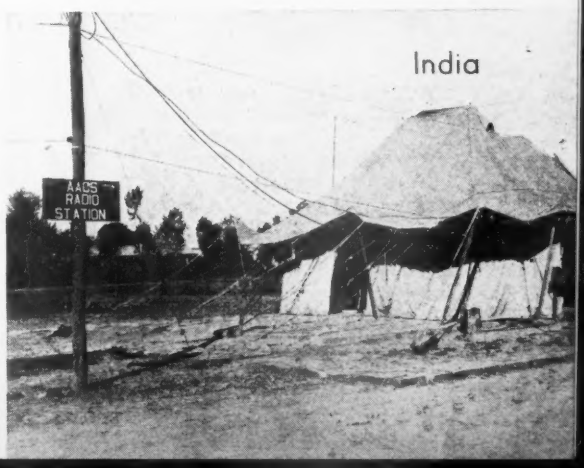
Elsewhere in this issue there appears a discussion of the specialized airways services used on the domestic airlines.[1] All of the commercial devices therein described are employed by AACS — as well as one or two more, about which little may now be said.

The manner in which these AACS services function to give a pilot the bearings and other assistance he requires can be illustrated by describing a typical flight over an overseas airway.

The point-to-point circuits come into the picture in the initial pre-flight phase — a "flight notice" giving all essential details of the flight being transmitted several hours before the take-off to all interested persons en route and to the airport of destination.

As departure time approaches the pilot establishes contact with the control tower operator and awaits take-off instructions. After taking off, the pilot circles until he has picked up the signal from the radio range at the airport from which he is leaving. Having found the leg pointing in the general direction of his destination, he heads out along it, keeping a constant signal in the 'phones.

[1] Onnigian, "Radio Aids to Avigation," p. 24.



From the Equator to the Arctic, AACS stations safeguard the skyways. This is an AACS ground direction-finder installation at a West Indies Air Base.

Making necessary adjustments according to charts with which he is provided, the pilot sets his course on the automatic pilot. Thereafter the plane flies itself along the beam. Midway along the route it intercepts the approaching beam from the AACS station at the airport of destination, and the robot pilot automatically shifts course to ride this beam to the field.

Darkness may have fallen when the pilot reaches his destination, but the lack of visual ground reference points and landmarks doesn't concern him. He knows that, once over the airport, he will intercept the circular vertical beam of the "Z" marker and an indicator on his instrument panel will inform him when he is directly over the field. Passing over this marker, he returns down the opposite leg of the radio range beam, which is aligned with the principal landing strip, and proceeds to let down — that is, if the airdrome control tower permits him to do so.

Once within the airport control zone the pilot is subject to the authority of the aircraft control operator in the airdrome control tower, strategically located to command a clear view of the entire field. As required by regulations, the pilot establishes contact with this operator and awaits instructions. He is told where and at what altitude to circle until cleared for a landing, when to come in for a landing, the runway he is to use, and the wind direction and velocity.

Thus are Allied military aircraft guided safely from one airport to the next anywhere on the globe by the AACS-operated signposts of the air.

### *Safety in the Air*

The radio range beacon makes traveling the highways of the sky, even in fog and darkness, as safe relatively as riding in an automobile along a lighted parkway. It lays down a straight, direct, unmistakable path for the pilot to follow; no plotting of courses or calculation of bearings is required. Even over mountainous terrain the beam leads the airplane through the safest passes and keeps it clear of dangerous peaks.

Of course, accidents can occur even on a brightly lighted, well-marked highway. AACS provides for such contingencies as well. Should an unanticipated storm arise, the pilot would receive warnings and explicit instructions via the air-ground radio channel. Should he be forced off his course and unable to relocate the radio range, the tone-modulated transmitter of the AACS homing beacon at an airport within range would provide him with a radio-compass bearing by which to set a new course. Even should he be forced down at sea, so long as his transmitter could be kept functioning the direction-finding stations of an AACS d/f net would take bearings on him, getting an exact fix by triangulation from several stations, and the central evaluating station would direct the sending of rescue agencies.

Nor does this complete the list of measures provided by AACS to ensure the safety of aircraft in flight. Fan markers, similar to "Z" markers except that they emit an elliptical pattern, are placed along the route to warn the pilot whenever he is approaching a dangerous obstruction. Advanced types of direction-finding and locating equipment requiring no transmission from the plane itself are being increasingly employed. A growing number of instrument-landing approach installations at principal airports enable the pilot to land safely even when visibility is zero.

The proudest accomplishment of the AACS is the safety the operation of the system has lent to flying the Army airways. The importance of that contribution certainly cannot be overemphasized. The psychological effect upon flight crews in improving the reliable delivery and operation of aircraft on schedule, even under unfavorable weather

*Left* — An AACS Airways station in India. *Right* — Interior of an AACS communications station in India.

**Another AACS ground direction-finder installation, located at a far northern base.** *Official AAF photographs.*

conditions, alone is of significant importance. And the saving from accident prevention — using the term "accident" to cover anything from an inadvertent landing with wheels retracted to the loss of flights of bombers on ferry routes — undoubtedly has been sufficient to pay for the entire cost of all AACS facilities and more. Hundreds of millions of dollars worth of aircraft and tens of thousands of lives have been safeguarded by the safety and navigational facilities afforded by the Army Airways Communications System.

### *Men and Morale*

That's one reason for the high spirit of morale prevailing among AACS personnel. There's a genuine thrill in picking up a signal from a bomber or transport gone astray over a long overwater route, lining up other stations to triangulate d/f bearings on it, and finally steering it safely into the field — perhaps with only enough fuel left for five minutes more of flight. Even such a relatively commonplace occurrence as reminding an absent-minded pilot to lower his wheels before he scrapes the belly of his ship on the tarmac — which may happen a dozen times a day, and soon becomes nothing more than routine — is no small source of satisfaction.

It takes more than a crack operator to do that kind of a job. It takes a man with his wits about him and a knowledge of what goes on in and around an airplane. For this reason all AACS control tower operators get Link trainer time, so that they may have a first-hand knowledge of the pilot's problems — a form of training not, so far as is known, given other radio operators anywhere. It is all part of the training which schools the men to meet any emergency swiftly and with judgment. An AACS operator must be as good as any radio operator anywhere, and in addition he must know the rules and routine of the airways, learn the technique and the specialized jargon, occasionally become a semi-professional weatherman, and in general become proficient in a multitude of specialized skills.

The proficiency requirements are emphasized by the multiplicity of services rendered by AACS personnel — control tower operation, air-to-ground communication, navigational radio ranges, direction finding, the collection and distribution as well as the broadcasting of weather information and the maintenance of message centers, including not only the radio transmission and reception but the cryptographic processes. The AACS handles every step of the communications process, including all the intervening phases such as coding and decoding, taking the plain-language message blank from the hand of the sender and delivering it, again in plain language, to the ultimate recipient.

So complex are these operations that 21 different kinds of enlisted specialists are required. This diversification, together with the fact that 95 per cent of AACS enlisted men are specialists, has made both the procurement and training of personnel a critical problem.

### *Training — Ham Style*

The AACS does not conduct a basic training program of its own. In the early stages its personnel requirements were filled by men who came to it self-trained, chiefly from amateur ranks. At present its manpower requirements are filled from the general Air Forces Personnel Pool, and the men assigned to the command are already trained as qualified specialists in their fields. Most AACS enlisted personnel — radio operators, radio mechanics and control tower operators — is trained at the AAF Technical Training Command's Truax Field School at Madison, Wis., in special courses developed in coöperation with AACS.

*Left* — **Inside an AACS station in Alaska.** *Right* — **In the transmitter building at a typical AACS station.**

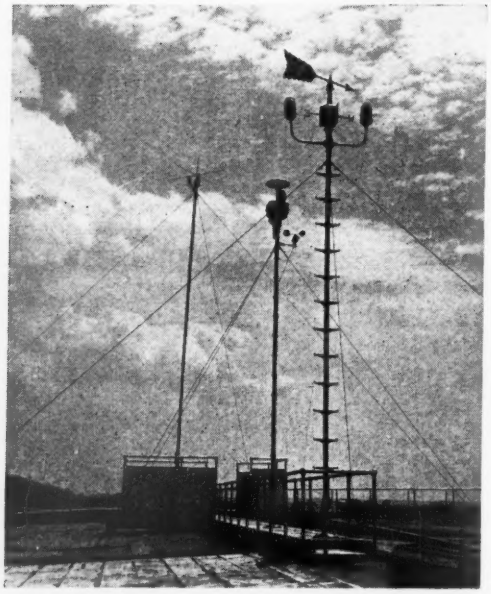

Only the highest-rated men in a class are assigned to AACS. Even with these highly qualified men, however, there is the inevitable lag between coming out of school and becoming a proficient operator on a crack circuit.

To supply the extra ability required for AACS work, additional in-service training is required. In general this is given, not in the classroom, but rather under the "learning by doing" principle — the apprentice technique. In the AACS they call it "elbow supervision." The new man is first assigned to duty as a junior operator in a domestic station. There he takes over regular watches, but always with an experienced man at his elbow to make sure that no mistakes are made which would endanger the performance of the system. At the same time he instructs the student in the fine points of operating procedure and technique.

This "in-station" training is an attempt to supply the equivalent of prior amateur experience. The student goes through the experiences of a first QSO and then progressively acquires proficiency, exactly as he would if he were a beginning ham diligently operating his own rig.

**AACS control-tower operators are the traffic cops of the military airways. These are views of a typical AACS airdrome control tower at an American base. *Above* — The control tower is strategically located on the field to command a clear view in all directions. *Right* — Operating positions are located in a glass-enclosed room high in the tower. The aircraft control operator at the right is transmitting instructions to an airplane entering the airport control zone, which is his sphere of authority. *Below* — Close-up of the wind-recording instruments and a v.h.f. antenna atop the airdrome control tower.**

*Official AAF photographs.*



The new operator usually starts out in an air-ground station. This is perhaps the easiest service from the standpoint that code speeds are low, although the responsibility is great. Then he moves up to a point-to-point manual circuit, handling traffic in both coded and plain language — but usually coded. Finally he goes into the weather service, which is the most demanding. Always, however, until he has served the entire routine of apprenticeship, he works under close supervision.

After this apprenticeship period he is ready for assignment to a station overseas. Recently an "overseas processing squadron" was established to provide supplemental training for men destined for overseas duty. This unit serves the dual purpose of supplying the required special training and of maintaining their proficiency by giving the men regular practice while awaiting shipment.

By the time a man is ready for assignment his abilities have been pretty well determined. His assignment in AACS depends upon his record at school as well as on observation and study of his

*(Continued on page 100)*

# Topography and V.H.F. Wave Propagation

***Contour Maps as Guides In Selecting Transmitter Sites***

BY HOLLIS M. FRENCH,* WIJLK

AMATEURS who have explored the v.h.f. field have been led to feel at times that discrepancies between theory and practical experience increase in geometrical progression as the frequency is raised. If this is true with respect to the construction of transmitter, receiver and antenna, it is even more apt to be the case in solving the problems of v.h.f. wave propagation. The reason lies in the complexity of the effects of topography upon very short waves, whose

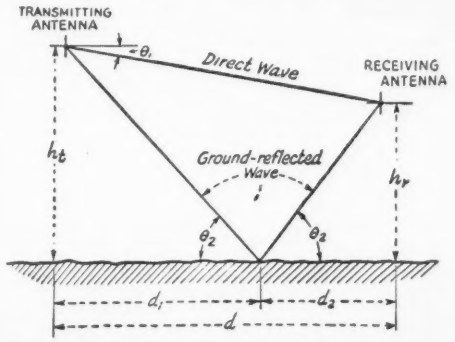



*Fig. 1* — Diagram showing how the direct wave and a ground-reflected wave combine in the space wave.

nature requires that their radiation should be concentrated at the lowest practicable angles to the horizon. At such angles ground effects are at their maximum.

Effective propagation in this field lies mainly in the *ground wave*. By our definition the ground wave is that part of the total radiation which is directly affected by the presence of the ground. This includes not only ground currents in the immediate vicinity of a transmitter and the *surface wave*, which follows earth contours much as a wave is guided by one wire of a transmission line, but a *space wave* as well. The latter is not to be confused with the ionospheric or sky wave, which is returned to earth only under exceptional conditions at frequencies above 40 Mc. and never at frequencies above 60 Mc. Nor should the space wave be identified with the *tropospheric wave*, which is refracted or reflected at surfaces of abrupt change in the dielectric constants of the lower atmosphere. The tropospheric wave is of increasing interest and value to the v.h.f. amateur and will be discussed in its turn, since its propagation is also indirectly affected by certain topographical features.

The ground wave, with its component space and surface waves, is directly affected by the presence of the earth and its surface features, including differences in elevation, vegetation and the works of man, such as cities and wire lines. The surface wave, or earth-guided wave, is subject to such a high degree of attenuation at these frequencies that it need not be taken into account except over very short paths. The space wave is considered to have two components, the *direct wave* and the *earth-reflected wave*, as shown in Fig. 1. The direct wave is considerably affected by the manner in which ground-reflected waves combine with it at the instant of reception, since there may be phase relationships which will either reinforce or attenuate the strength of the field at the receiving point, depending upon the differences in the several paths of travel.

### *Ground Reflections*

Two classes of ground reflection are recognized: *specular*, resulting from a smooth surface (such as a plain, or still water) or a surface having irregularities which are small compared with the wavelength; and *diffused* reflection from surfaces whose irregularities are large compared with the wavelength. Specular reflections can be calculated with a fair degree of precision, since they follow the laws which govern the reflection of light waves. The angle of incidence of the reflected ray is equal to the angle of incidence of the downcoming ray, while the sine of either angle is equal to the product of the dielectric constant of the ground and the sine of the angle of refraction in earth. Although the effective plane of reflection is somewhat below the actual

**Not all hams are so fortunate as to reside at a location favorable for their ether-busting pursuits. The inequalities of QTH, often conflicting with the urge to work DX, give rise to a special ham type of social climbing — a term which may be applied in a most literal sense to one favorite activity of the v.h.f. gang. The problem of effective propagation of very-high frequency waves involves the influence of topographical conditions in a large degree. While the writer does not profess to know all the answers, he brings together in this article theoretical data from the published findings of authorities, together with observations from his own experience. Its purpose is to offer suggestions to the v.h.f. operator for making as shrewd a choice as possible of locations either for portable operation or for a permanent residence.**

*Assistant Technical Editor, *QST*.

surface, the difference is relatively slight at the very-high frequencies.

Practical considerations for securing effective propagation of the ground wave will involve the elevation of the surface at transmitting and receiving points above sea level and above surrounding terrain; height of antenna above ground at transmitting and receiving points; the nature of the surface at points where ground reflections will occur; and the presence of reflecting media behind the antennas. In general, favorable addition of direct and reflected radiation is facilitated on slopes facing towards the transmitter, and is unlikely on slopes facing away from the transmitter. If the slopes are short, field maxima are near the tops, but, contrary to a common misconception, not necessarily at the summit. The height of the summit may be such with respect to the surrounding terrain that ground-reflected waves will actually interfere with the direct wave and decrease the signal strength.

### *Contour Maps*

Either in choosing a location for portable operation on the very-high frequencies or for establishing a permanent residence favorably situated for v.h.f. operations, the first step in any investigation is to obtain contour maps covering the entire region to be considered. Such maps are published by the United States Geological Survey and may be obtained from many stationery stores at 15 cents each, or from the Director, U. S. Geological Survey, Washington, D. C., at 10 cents each, a discount of 40 per cent being allowed on orders amounting to $5.00 or more at retail price. Index maps showing portions of each state covered by individual "quadrangles" of the series may be obtained free. Fig. 2 shows how a typical variety of terrain is drawn upon the maps. The contour lines represent imaginary lines upon the surface of the earth, every part of which is at the same altitude above sea level. They are drawn at regular intervals of altitude, representing the vertical distance in feet between one contour and the next. In flat country this distance may be as small as 1 foot, while in a mountainous region it may be as great as 250 feet. A widely used interval is 20 feet. Every fourth or fifth line is drawn heavier than the others and is identified by figures showing the altitude above sea level. The seacoast is the zero contour. The 20-foot contour would be the shore line if the sea should rise 20 feet. The scale of miles most commonly used is one mile to the inch. In recent years, however, many regions have been resurveyed and drawn on a scale of one-half mile to the inch. Whenever available for a selected region, the more detailed maps are desirable for our purposes.

### *Selecting a Site*

The problem of selection of a transmitting site is simplified in level country. The choice rests among the most elevated locations available, with a preference for those near a lake or river. Wooded areas and the vicinity of high-tension power lines are to be avoided, as well as the presence of many buildings.

In hilly country a much more careful inspection of the possible sites is required. The same considerations apply as in level terrain, but with added problems. Directional effects are certain to be encountered and many of them can be determined from an inspection of the contour maps. Generally it is necessary first to make a decision as to what directions are most desirable, since some compromises must be accepted, and to search the map for features which may reinforce radiation in favored directions, such as slopes behind the site and favorably located valleys or gaps among the hills. If there are no directions practicable for ground-wave propagation, the operator will have to join the "Troposphere Club." That, however, is by no means a hapless lot. We shall deal with his case a little further on.

In Fig. 2, five sites are indicated for the purpose of illustrating various effects of propagation. Although some have been designated particularly as transmitting points and others as receiving points, any one might be considered as either. $T_1$ is a particularly favorable location for propagation in directions across the water, both because of its position on the edge of a cliff and because of the presence of salt water, which affords the most favorable of all ground conditions. It is also favorable for transmissions to points within the valley, because of its elevation and the wave-guide effect of the river and the bordering hills and escarpments. $T_2$, on the edge of a steep scarp, should be a good location for directions up and down the valley and those across the valley and the hills beyond, by reason of its elevation and the height above reflecting surfaces in the easterly direction. In a westerly direction some improvement might result from a location farther down the slope in that direction, especially if minor surface features at some point would provide favorable reflections eastward from the transmitter.

$R_2$ looks like a poor location, shadowed by the bluffs to the west, but may prove to be an excellent site for easterly and southeasterly transmission if the antenna is carefully placed with respect to the "focus" of the natural paraboloid reflector behind it. In such locations it is common to find excellent reception for signals from beyond the rounded hill to the east, even though the antenna is far below the line of sight. Diffraction of the incoming waves over the hill and reinforcement by local reflections account for this. It must be stressed, however, that this is the type of location in which extensive experiment with the placement of the antenna and its height above ground will determine the degree of success in "getting out." Often a shift of as little as a fraction of a foot in the location of the antenna, or a fraction of a half-wavelength in its height, will bring about a striking modification of the response.

$R_1$, although not on the summit of the hill, indicates a site which is apt to be excellent for

reception or transmission in practically all directions. It is near enough to the summit to receive the advantage of diffraction of oncoming waves from the east, while its elevation and location with respect to the valley are favorable alike for north–south and westerly directions. It is close to an ideal v.h.f. site, yet even here care in the placement of the antenna and adjustment of its relation to the ground will reward the experimenter — as is always the case, no matter what the location. $T_3$ represents a location which will probably offer favorable conditions only in directions up and down the valley for ground-wave propagation.

### *Field Surveys*

A preliminary map survey such as has been illustrated by the simplified example furnished in Fig. 2 and in the foregoing text should be followed up with visits to likely locations plotted on the map, to check up on minor surface features and culture not indicated on the map as well as on the general type of soil and its conductivity. If not combined with this preliminary investigation of the ground, an operational survey should follow at one or more of the selected locations. Portable transmitter and receiver equipment with self-contained power supply is indispensable at this stage. The antenna also must be portable, but not of the type mounted on stand-offs on the rig. It is important to investigate ground effects as nearly as possible under the actual antenna conditions contemplated for permanent installation, if a permanent location is the object of the tests. Even if Field Day or other temporary operation is the object, the highest possibilities of a good location may be lost through inability to adjust antenna height to local conditions.

As an example, we recall an expedition which was shared with W1APJ some years ago. Our objective was 56-Mc. operation from Mt. Everett in southwestern Massachusetts. This climb made a pleasant outing, but proved to be a dismal failure from the operational viewpoint. The elevation of the summit was 2624 feet, quite in the clear; no shadowing from near-by peaks appeared to obstruct the line of sight for many miles. It should have been an ideal location for portable v.h.f. operation. Perhaps it is. We never found out. We could hear second-district stations there that we could not have heard at lower elevations without the benefit of marked tropospheric reflections. But the signals were weak and muffled, while our calls were unheard at any distance. The distortion observed should have warned us that we were receiving unfavorable ground reflections — probably in the immediate vicinity of the receiving antenna, which was mounted on the portable cabinet and set up on a rock. We blamed air conditions; we postulated the presence of an adverse magnetic field resulting from possible iron-ore deposits; but we did not try adjusting the height of our antenna above ground, nor did we explore various locations around the summit for a better combination of ground effects. We knew but little then of ground-wave propagation theory, and we were not equipped for flexible adjustments of our antenna. We were on the top of a fine peak and we had expected to find strikingly good conditions as a reward for our laborious climb from the parking place, burdened with batteries and gear. We were disappointed. It was late; we were tired. We soon gave up trying and descended to the parking place some four or five hundred feet below the summit. There we made ready to camp for the night in a lean-to whose rear wall bore Mrs. Roosevelt's autograph (?) and took time to make a last listening search of the band. Stations were coming in with excellent volume and quality. They were to the east and south of us, directions facing the slope on which we were camped. We had some interesting contacts, received very good reports on our flea-power signals, and finally rolled up in our blankets, wondering why we shouldn't have done just as well from the summit. Not willing to risk wasting our next day and evening there, we returned to Connecticut and spent the night on Soapstone "Moun-

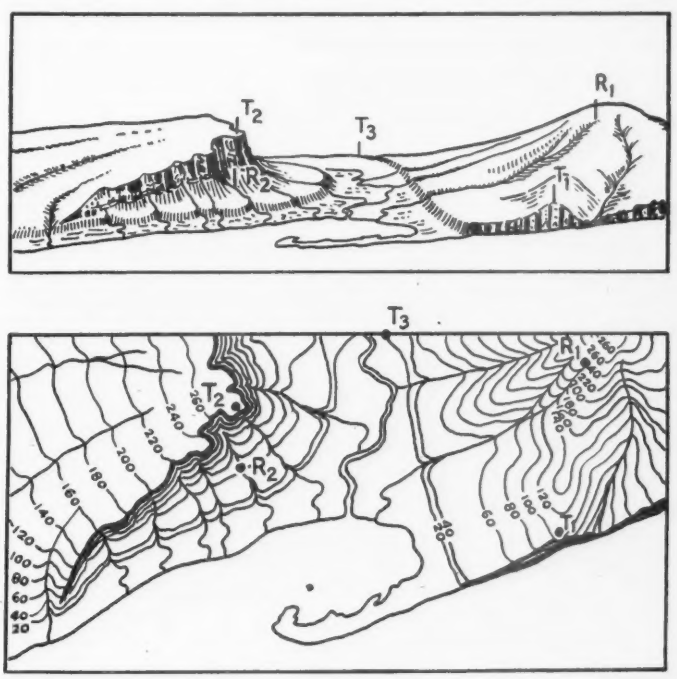



*Fig. 2 — Top* — Perspective sketch of varied terrain, from publications of U. S. Geological Survey. *Bottom* — Contour map of the same region.

tain" in Somers, a proved location, though at an elevation of only 1060 feet. That night we worked 56-Mc. stations in the second and third districts with astounding signal strengths, until we could stay awake no longer.

What was the difference? "Conditions"? That seems doubtful. Location? We are now inclined to think that the higher mountain afforded a far better location somewhere near its summit. We did not find it, however, since we had made no search for it. We did not even make the best of the location we did try, since we had a fixed antenna height (probably fixed at the wrong height) in terms of fractions of a half-wavelength above ground. A change in the angle at which part of our major lobe of radiation was striking reflecting surfaces quite possibly would have made a decided difference in the results of our night on Mt. Everett. Local terrain on Soapstone Mt. chanced to favor the use of typical set-mounted antennas such as we employed, in common with most of the 56-Mc. gang at that time.

Anyone who has undertaken the trouble and expense of providing portable v.h.f. transmitter and receiver equipment is foolish indeed if he fails to go one step further and provide himself with an efficient portable antenna having a mounting which allows of precise adjustment at least of the height above ground, as well as adjustments of polarization and orientation if possible. The consideration in design of the portable v.h.f. antenna mounting is not simply maximum height above ground; it is actually more important to provide for *variation* in height above ground over a range of at least one wavelength.

Getting back to our original survey of possible locations for a v.h.f. "ham's paradise," we lend one ear to the YL's ideas as to where the rock garden and the clothes-yard should be located while we set up the probing antenna and hook on the gear. If we like the location and the FHA likes us, we may decide to set up housekeeping here. First, however, we shall go over the terrain with the portable gear as thoroughly and repeatedly as possible, keeping a detailed log and averaging the results in terms of field strength and *quality*—not field strength alone! There are many spots in mountainous country where the reading of a field strength meter may be relatively high on a v.h.f. signal; yet, because of multiple reflections from jumbled surfaces, the waves which are combining to build up the field strength

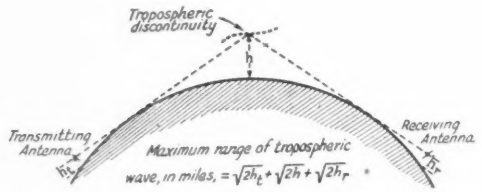



*Fig. 3* — Diagram showing conditions which provide maximum possible range for a tropospheric wave when the transmitting and receiving antennas are elevated.

Maximum range = $\sqrt{2h_t} + \sqrt{2h} + \sqrt{2h_r}$.
The heights are in feet, the range in miles.

are severely affected by differential side-band fading, so that reception of A-3, A-4, A-5 and f.m. emissions becomes impracticable.

The first probing antenna should certainly be a simple half-wave dipole. Trick antennas and directional arrays may be called upon later to build up strength over favored paths, but the qualitative survey should not be complicated by any added directional effects since the rocks, hills and trees provide plenty of such effects and it is these in which we are interested.

Signals employed for survey reception will preferably be those from stations which are able and willing to maintain stable signals. Test transmissions from the portable equipment should also be stable, in order that reported variations may be interpreted solely with respect to the conditions of propagation. Perhaps the most difficult problem for anyone seeking to test under controlled conditions lies in the interpretation of various reports from the field on signal strengths of transmissions from the test location. The best solution may not rest with the cumbersome expedient of moving a complete receiving installation (including carrier-strength meter and antenna) from station to station, but we know of none better for obtaining some degree of control. He is not an overly suspicious soul who distrusts the usual ham "report." Ears differ, receivers differ, S-meters have but slight standards of agreement, and antennas differ.

If the purpose of the tests is not to select a permanent location but to get set for Field Day operation, probably less time and effort can be afforded for a searching survey. Yet it pays to investigate as thoroughly as possible even in such a case, in order to make the most of the low power used in the field. Initial study of the contour maps is usually practicable, even if extended tests in the field cannot be undertaken in advance. An ARRL Field Day itself offers a golden opportunity for tests which might be difficult to arrange at other times.

### *Making the Best of It*

We must not forget the brother who is compelled to make the best of bad conditions in a fixed location. He is thereby nominated for the Troposphere Club, in which even his more favored v.h.f. brethren are glad to claim membership. There is something about lower atmosphere bending, or tropospheric-wave propagation, that wins friends and influences hams with the instinct for v.h.f. The amateur is not bound by the conditions of a license by which he is required to maintain a minimum field strength over a dependable service area, as in the case of a broadcast station. He is free both to experiment with ground-wave propagation and to pursue DX by means of the tropospheric wave, thus far rejected as useless for "practical" applications. Perhaps the challenge of the troposphere lies in that very rejection, so like the early attitude of the commercials toward 200 meters.

Since so much of the published technical data on v.h.f. techniques has been prepared from the

viewpoint of the commercial engineer's problems, many amateurs, unfortunately, have become confirmed in unfavorable opinions concerning the usefulness of their v.h.f. bands for anything beyond "backyard" communications. Random ventures in the use of crude gear, too often nothing better than noisy transceivers, have not helped matters. The membership of the Troposphere Club remained a select few, even in the happy days before the Chief Wave Bender enlisted his pliers in the service of Uncle's Navy.

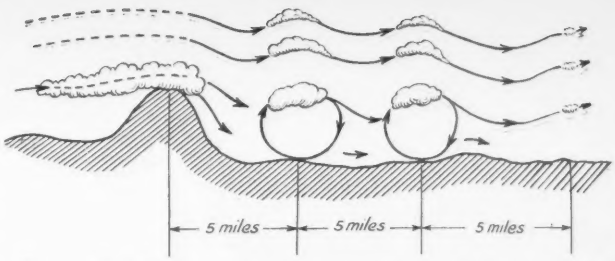



*Fig. 4* — Standing waves in air currents, illustrated by the so-called "Moazagotl condition" behind a mountain range.

The tropospheric wave is that part of the total radiation which is principally affected by the presence of surfaces of abrupt change of dielectric constant in the lower atmosphere, such as the boundaries between warm and cold air masses. Such discontinuities may exist as a result of the heating of air above a cloud layer by reflection of the sun's rays from its upper surface, or the rapid cooling of surface air after sunset at a rate greater than that of higher air. They may be the result of the heating of a sinking air mass by compression or of the overrunning of a layer of warm air by a layer of cold air. These four cases are various types of *temperature inversions*. Similar discontinuities are produced by updrafts along a ridge or mountain range on the side facing the prevailing winds. Contours as low as 60 feet will affect these smaller air-mass movements. Glider pilots soaring over the sand dunes near Frankfort, Mich., have maintained altitudes of more than 2000 feet by means of these updrafts.

Discrete air masses form near the sea coast and the shores of large lakes, with others at the boundaries of desert regions. Small convection currents, known as "dry thermals," rise above heated areas. There are many other ways in which topographical features will affect the dielectric constants of overlying air masses and so indirectly affect the propagation of the tropospheric wave. If anyone is tempted to consider some of these effects as belonging to an order of magnitude too small to affect propagation, let him recall that reflections of v.h.f. waves are commonly observed when an airplane passes within a range of several miles from the receiver. Those who feel that the nature of the surfaces of discontinuity are such as to offer only extremely weak reflections should recall that we have to account for coefficients of reflection of the order of only 0.01. In v.h.f. work we are chiefly concerned with propagation in a nearly horizontal direction. A large portion of the reflections are at near-grazing incidence, in which cases the coefficient tends to be unity regardless of the difference in dielectric constant.

Fig. 3 shows the maximum possible distance that may be covered by a tropospheric wave in one "hop." In order to calculate distances by means of the formula given, the height of the reflecting layer must be known. This factor is far less stable than in the case of ionospheric layers and generally must be determined by experiment, except in the case of fronts of the larger air masses whose approximate heights may be calculated from the reports of the Weather Bureau. In general, these are of the order of 2000 feet.

### *Investigating Topographical Effects*

Investigation of the smaller discontinuities which exist in connection with topographical features, as before mentioned, opens an interesting field for amateur experiments. The existence of updrafts on the side of a ridge facing the prevailing wind is a relatively stable condition. A long ridge rising out of flat country, or water, causes the most uniform and vigorous slope currents. The v.h.f. experimenter who lives in the vicinity of such a ridge should be able to learn a great deal about his local tropospheric propagation conditions through the use of kites and captive balloons, pilot balloons, and, when amateur frequencies are again available, a simple radiosonde instrument such as was described in the December, 1943, issue of *QST*. "Duration" experiments naturally will be confined to such expedients as soundings with a miniature receiver borne aloft by a kite or a captive balloon, using as a kite string a stranded pair of small-gauge insulated wire which will serve as a long 'phone cord. Signals from f.m. stations may be received by means of a simple superregenerative receiver for this purpose. Bearings taken with a theodolite will determine the altitudes reached by the receiver. Ground reception employed in connection with the kiteborne superregenerator also will provide some indication of changing conditions, by means of the unavoidable radiation from the receiver aloft.

There are many variations of the conditions governing slope currents which may be of interest to the experimenter. For instance, when the wind velocity is low and the *lee* side of a ridge is heated by the sun, giving rise to a "thermal" on that side, air may move up the ridge from all sides. The slope current is then well to the rear of the summit, and for certain locations its reflection might add directivity to propagation in a direction opposite to that of the normal slope current.

Another exceedingly interesting tropospheric effect, known as the "Moazagotl condition," is associated with the topography of certain regions. Although the effect was first discovered in Si-

(*Continued on page 96*)

# IN THE SERVICES

WHILE 1944 is still in its early infancy and good resolutions are filling the air, we hope that somewhere on your list you've written: "Resolved: to send in my Amateur War Service Record." But don't let it end there — as most resolutions do! Set your course *now* for page 30, fill in the blank, and we'll carry on from there.

Those of you who are renewing your ARRL memberships, please be sure to include your call; many hundreds of servicemen could be added to the roster if this information appeared on all renewals. Our Circulation Department lends a helping hand and forwards all membership correspondence with possible ITS value to this department, but when no call is given we cannot use the information. Just one more instance where a call is as important as a name!

Thanks are in order to all of you engaged in 100 per cent war work who have sent in your service records. The response has been excellent, and we've collected hundreds of names. These are being duly sorted and checked and will be ready for publication shortly. We hope you will continue to register with us, so that we'll have a sizable enrollment for this classification.

Civil Service employees are still coming through in fine style and their section of the file is beginning to look impressive. Keep it up!

Altogether ITS had a good year, but here's looking forward to a bigger and better one.

## ARMY—AIR FORCES

A/C LEO TEVLIN, W9ZVJ, comes forth with a sound suggestion for promoting permanent world peace. He writes: "If the friendly ham spirit was universally taught, there wouldn't be much basis for hard feelings and wars."

1DNQ, Martin, Pvt., Madison, Wis.
1MEX, Darling, Pfc., Seymour Johnson Field, N. C.
2BFU, Kensella, S/Sgt., address unknown.
2CZ, Bird, S/Sgt., foreign duty.
ex-2EUV, Murray, 2nd Lt., Miami, Fla.
2GUX, Mucks, Pfc., Smyrna, Tenn.
2ICJ, Adrosko, Cpl., Camp Pinedale, Calif.
2MCY, Tracy, S/Sgt., Blytheville, Ark.
2MNP, Goldstein, Pvt., Brownsville, Tex.
2MTK, Schabinger, A/C, Santa Ana, Calif.
2OKM, Boulle, A/S, Oshkosh, Wis.
2OOV, Israel, Capt., Kearney, Nebr.
3BD, Anspach, Lt., Monroe, La.
3DWM, O'Brien, Sgt., Dover, Dela.
3GGE, Schaffer, Cpl., address unknown.
3GHH, Lehmann, Sgt., foreign duty.
3JLW, Davis, A/C, Seymour Johnson Field, N. C.
3JSO, Woodside, Pvt., Amarillo, Tex.
4FBD, Melvin, Lt., foreign duty.
K4HDZ, Krisberg, Capt., foreign duty.
4IAO, McClellan, S/Sgt., foreign duty.
4IDZ, Foster, A/S, Sioux City, Iowa.
5BOC, Donell, Lt., Austin, Tex.
5CGW, Reed, Lt., Independence, Kan.
5EWI, Riedel, 2nd Lt., Boca Raton, Fla.
ex-5GIP, Coleman, T/Sgt., Ft. Lauderdale, Fla.
5GLU, Bandow, 2nd Lt., address unknown.
5HMV, Waller, Sgt., Austin, Tex.
6LAI, Orthel, 2nd Lt., Jackson, Mich.
6PQL, Klitzing, Cpl., address unknown.
6QJW, Shepherd, A/C, New Haven, Conn.
K6SBU, Copley, T/Sgt., address unknown.
6SRU, Burns, Sgt., Fresno, Calif.
7HLD, Johnson, 2nd Lt., Barksdale Field, La.
7JCK, Pohmurski, S/Sgt., Dalhart, Tex.
8SLB, Helmig, S/Sgt., address unknown.
8SSM, Kimar, Pvt., Camp Crowder, Mo.
8SUU, Wingertszahn, S/Sgt., foreign duty.
8TAO, Roth, Sgt., foreign duty.
8UXY, Barna, Cpl., Chanute Field, Ill.
8WOJ, Christensen, Pvt., Auburn, Mich.
9AM, Johnson, 2nd Lt., Mitchell Field, N. Y.
9AOA, Carroll, Cpl., Camp Stewart, Ga.
9BIU, Jackson, A/C, Corsicana, Tex.
9CHS, Neilson, Pfc., Camp Murphy, Fla.
9FVI, Boren, Capt., Asheville, N. C.
9FXA, Burrows, Sgt., Pyote, Tex.
9JEL, Johnson, A/C, Seymour Johnson Field, N. C.
9JPL, McDonnell, Sgt., foreign duty.
9MGI, Watson, S/Sgt., foreign duty.
9OWK, Princell, Lt., Liberal, Kan.
ex-9OYR, Guttersen, 2nd Lt., Maxwell Field, Ala.
9RHT, Booen, T-Rep, foreign duty.
ex-9RHV, Hvambsal, Pvt., Madison, Wis.
9THR, Tressell, Cpl., foreign duty.
9UBL, Wroblewski, Pfc., address unknown.
9UGU, Oberg, T/Sgt., Langley Field, Va.
9UMK, Newman, A/C, Independence, Kan.
9YVT, Katzson, T/Sgt., foreign duty.

Operator's license only:

Bullock, M/Sgt., address unknown.
Evans, Pfc., Millville, N. J.
Kolks, Pfc., Kingman, Ariz.
Kopecky, S/Sgt., foreign duty.
Long, Cpl., Pyote, Tex.
McCormack, 2nd Lt., Portland, Ore.
McCourt, Pvt., Truax Field, Wis.
Pederson, Sgt., foreign duty.
Wollins, 2nd Lt., Mountain Home, Idaho.

## ARMY—SIGNAL CORPS

"YOU can always be sure there's a ham around somewhere, even out on the edge of civilization," a recent visitor at Headquarters informed us. He'd just returned from foreign duty and told us that one night while on a quick change-over job he found there were five hams from as many districts when one of the boys spotted an oscillator and tapped out a CQ.

1KME, Zouras, T/Sgt., foreign duty.
1LZG, Johnson, T/3, foreign duty.
2CVG, Prior, Lt., Fort Monmouth, N. J.
2FNT, Kakstys, T/4, foreign duty.
ex-2GAO, Lekas, Pvt., Camp Crowder, Mo.
2HQR, Hallen, S/Sgt., Camp Barkeley, Tex.
2LJQ, Potter, Lt., foreign duty.
2MAX, Krasnican, Pvt., Camp Crowder, Mo.
3JCC, Kreyling, Cpl., foreign duty.
4BYX, Pryor, Major, Fort McPherson, Ga.
ex-4DOO, Gilson, Lt., foreign duty.
4GVN, Davis, Pvt., Dothan, Ala.
4GVV, Stevens, Fort McPherson, Ga.
4IGX, Meksraitis, Lt., Warner Robins, Ga.
K5AT, Knopp, Lt., Camp Campbell, Ky.

The sun-tanned one in the middle is Lt. Col. F. E. Handy, W1BDI-W1AW, ARRL Communications Manager on leave with the AAF. You guess where.

5DAN, Hutson, Camp Shelby, Miss.
5GHI, Richards, S/Sgt., foreign duty.
5HJJ, Frazer, 2nd Lt., Fort Monmouth, N. J.
5JJ, Southworth, Capt., foreign duty.
5KCY, North, Cpl., Petaluma, Calif.
5KNC, Kingsley, Alamogordo, N. M.
6IEZ, Schuchard, Sgt., foreign duty.
6IGA, Alcala, Lt., Daly City, Calif.
6LXQ, Cannon, Lt., foreign duty.
6SUP, Metke, T/Sgt., Fresno, Calif.
7EVE, Whinery, T/Sgt., foreign duty.
K7FUO, Kine, T/4, foreign duty.
7GEE, Carlton, Lt., Fort Monmouth, N. J.
7IFB, Sanders, Capt., Camp Shelby, Miss.
ex-7IHW, Burr, T/Sgt., foreign duty.
ex-8BDY, Lodge, S/Sgt., Breckinridge, Ky.
8IQQ, Greene, Lt., Miami, Fla.
8NTB, Marloni, Cpl., Camp Campbell, Ky.
8QXD, Bernstein, Lt., foreign duty.
8RDI, Nall, Sgt., foreign duty.
8RMD, Yount, 2nd Lt., Fort Monmouth, N. J.
8TXN, Fries, Cpl., Augusta, Ga.
8VHV, Beaubien, T/4, foreign duty.
9APM, Green, Pvt., Fort Monmouth, N. J.
ex-9AQB, Fuller, Lt., San Francisco, Calif.
9FQO, Riedel, T/Sgt., foreign duty.
9JPN, Woznick, Cpl., Camp Kohler, Calif.
9MTX, Small, T/Sgt., Presque Isle, Me.
9NUB, Blaine, Pvt., Fort McPherson, Ga.
9OGI, Flickinger, Cpl., foreign duty.
ex-9OYE, Boraker, Pfc., foreign duty.
9OZR, Evans, 2nd Lt., Philadelphia, Pa.
9PAA, Hope, Cpl., Camp Crowder, Mo.
9PSQ, Hansen, Lt., Warrenton, Va.
9PTQ, Moody, S/Sgt., foreign duty.
9PUV, Goddard, Sgt., foreign duty.
9TZK, Mathews, T/Sgt., foreign duty.
9UCT, Keintz, Sgt., Camp Campbell, Ky.

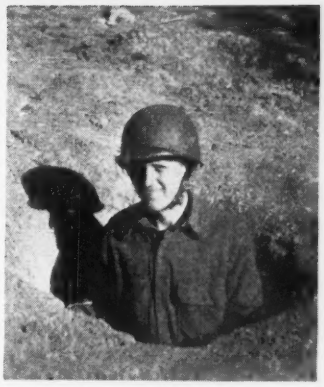
Operator's license only:

Colclasure, Pfc., Camp Pinedale, Calif.
Elliott, Cpl., Camp Campbell, Ky.
Herland, Pfc., Fort Monmouth, N. J.
Kuklierus, T/4, Machias, Me.
McLean, T/Sgt., foreign duty.
Price, 2nd Lt., Camp Reynolds, Pa.
Schiff, Pvt., Camp Ellis, Ill.
Strauss, Pfc., foreign duty.
Sullivan, Pvt., Camp Pinedale, Calif.
Tellis, Pvt., Camp Crowder, Mo.
Young, Pvt., Pittsburgh, Calif.

## NAVY—FOREIGN OR SEA DUTY

ALTHOUGH RM3c Owen, W6AGW, is on foreign duty in parts unmentionable, he managed to buy a used ("well-used," he says) copy of the 1942 edition *Handbook*. Well, even that edition will help you keep in touch with things, OM.

1FGX, Pierce, Lt.; 1LZS, Rounding, RT1c; 1NKM, Hattersley, RM3c; 2LXD, Ehramjian, R.E.; 3GAM, Garstka, RM1c; 3HLZ, Antrim, RT1c; 3JPW, Ellis, RM3c; ex-4BLY, Haralson, ACRT; 4FZO, Bacon, RM1c; 4GQD, Rosier, RT1c; 4HIC, McCullen, RM2c; 5FLU, Mills, RT1c; 5HSE, Donnell, ARM1c; 5IES, Robbins, RM1c; 5JOC, Kepner, RT1c; 5KDT, Wilson, RT1c; ex-6AD, Sanborn, CQM: ex-6BJT, Barty, RT1c; 6GQK, Barber Lt.(jg); 6LCZ, Christensen, Lt.; 6NTA, Buck, CRM; ex-6NTC, Hobaugh, CRM: 6OJG, Spicer, CRM: 6PJN, McGee, ACRM; 6RDH, Ensele, ARM1c; 6RPY, Hudson, RT1c; 6RZO, Miller, CRM; 6SBI, Sheriff, RT1c; K6TGP, Abreu, RT2c; 6TUE, Hadley, RM3c; 7AGZ, Jeans, RM3c; 7BAN, Bedwell, Lt.; ex-7BF, Crase, R.E.; 7CTJ, Upton, RT1c; 7ES, Russell, ARM1c; K7JDA, Walker, RM1c; 8ALW, Schubert, Lt.; 8BWL, Gnoyer, CRM; 8NNA, Murphy, RT1c; 8OHV, Gast, ARM3c; 8QNG, Pope, RT1c; 8WHJ, Mahan, RM3c; 8QXQ, Wood, Lt.; 9HBU, Welley, RT2c; 9IHQ, Garner, ARM3c; 9IWW, Romine, ART1c; 9NPC, Hill, RM2c; 9RYZ, Newell, RT1c; 9TBS, Moorlag; 9UJT, Stanley, RM3c; 9WSG, Anderson, RM1c; 9YQZ, O'Donnell, RM3c. The following have operator's license only: Coffee, RM3c; Compton, ARM3c; Dickson, ART1c; Hall, ART1c; Johnston, RM2c; Kapacziewski, S2c; Withoff, RM1c.



Bob Ehrler, W2CTO, a 20-meter c.w. bug from Brooklyn, surveys sunny southern Tunisia from the little foxhole which served him well in that campaign. Bob is now in Italy, a pfc. with a signal battalion. He has seen plenty of action since last November, having participated in the North African invasion from the start, and also the invasion of Sicily. Now he is in the Italian campaign.

## ARMY—GENERAL

QUITE often in our V-mail correspondence we find a letter from which the call has been deleted by a well-meaning censor. The other day, however, the mail bag gave forth a V-letter which contained not only the writer's call but also the censor's!

1FET, Pettipas, Cpl., Bayside, L. I., N. Y.
1KAD, Olssen, Pvt., Fort Bragg, N. C.
1LIC, Linscott, S/Sgt., foreign duty.
1MAH, Koon, Col., Boston, Mass.
1NMU, Streeter, Cpl., Washington, D. C.
2APP, Meister, Lt., Aberdeen, Md.
2CYK, Greenbert, Pvt., Fort Knox, Ky.
2HUS, Mucks, T/4, foreign duty.
2IAT, Boyce, Pfc., foreign duty.
ex-2IUA, Clark, Pfc., Camp Crowder, Mo.
2KKO, Zilliox, T/4, Camp Crowder, Mo.
2NHV, D'Onofrio, Pvt., Aberdeen, Md.
2NPO, DeBord, Pfc., W. Lafayette, Ind.
2NQB, Wantuck, Pvt., Fort Benning, Ga.
3HPV, Oliver, Pvt., Camp Davis, N. C.
3IMM, Canfield, Pvt., Temple, Tex.
3JEI, Hatton, Pvt., Camp Hood, Tex.
3JMT, Feehrer, Pvt., Fort Custer, Mich.
3JRG, Pallies, Pvt., Baton Rouge, La.
4COQ, Wilson, Pfc., Camp Gruber, Okla.
ex-5DVN, Elliott, Lt. Col., Camp Hulen, Tex.
5JIS, McKnight, Lt., Camp Hood, Tex.
5JUX, Blocker, M/Sgt., Mineral Wells, Tex.
5KAW, Beader, Sgt., Greenville, Pa.
ex-5WA, Holland, Pvt., Camp Mackall, N. C.
6APS, Nelson, Capt., foreign duty.
6PDL, Savage, T/5, Tarzana, Calif.

Brothers and hams, D. E. Stewart, ARM1c USN, W9IYH–ex-W7HBO, and Sgt/T P. L. Steward, W7GVC, both are serving their country. W9IYH spent 19 months in the Aleutians, first aboard a destroyer and then as radioman with a PBY patrol squadron before going to the Corpus Christi Naval Air Station. W7GVC saw action as a radioman in the infantry in New Guinea for 7 months before he was transferred to Sheppard Field, Tex., to take A/C training. (See Correspondence from Members, p. 67, for further details.)

6QMY, Clifford, Pvt., Camp Callan, Calif.
6QZE, Trammell, Lt., Camp Wolters, Tex.
K6SAR, Bloyd, Lt., foreign duty.
ex-6SLK, Casebeer, Pvt., Camp Abbott, Ore.
K6TTY, Coleman, T/Sgt., foreign duty.
7EYS, Donovan, Lt., Fort Sill, Okla.
7FRQ, Kruska, T/Sgt., foreign duty.
7HYV, LaPlant, S/Sgt., foreign duty.
7IVJ, Woods, Camp Hale, Colo.
8JVB, Russell, T/4, foreign duty.
8LRZ, Holowaty, Sgt., Charleston, S. C.
ex-8TSY, Coulter, Pvt., Camp Swift, Tex.
8UNA, Karbo, Pfc., Newark, Dela.
8USE, Doerr, Pvt., Los Angeles, Calif.
8UTR, Sahfran, foreign duty.
8WCT, Allen, Pvt., State College, N. M.
8WTF, Seymour, Pfc., Auburn, Ala.
9BGK, Kersten, Pfc., Chicago, Ill.
9BGF, Dollar, Pfc., foreign duty.
9GCZ, Smith, T/4, foreign duty.
9GEP, Hoover, Pvt., Camp Roberts, Calif.
9GVP, Flanagan, M/Sgt., Camp Haan, Calif.
9IQT, Swift, Pvt., foreign duty.
9LSS, Gorman, Pvt., Camp Blanding, Fla.
9MCM, Hale, Pvt., Fort Custer, Mich.
9NBO, McFall, Pvt., Camp Blanding, Fla.
9PPC, Talen, Pvt., Holland, Mich.
9QOI, Foster, Capt., Camp Hulen, Tex.
9WDB, Kay, Lt., Camp Hood, Tex.
9YMB, Cory, Pvt., Fort Knox, Ky.
9ZFR, Webb, Pvt., Camp Rucker, Ala.
9ZIC, McNeil, Sgt., address unknown.
9ZMU, Moore, Lt., foreign duty.
9ZZD, Astrin, Lt., Jefferson Bks., Mo.

Operator's license only:

Chase, Pvt., Clemson, S. C.
DeWitt, Cpl., State College, Pa.
Kruger, Fort Knox, Ky.
Moss, Major, foreign duty.
Sparks, M/Sgt., foreign duty.

## NAVY—GENERAL

THE mother of one seagoing OM wrote in to tell us that her son has participated in 37 raids in Africa and Italy. That's quite a record, and here's wishing him continued good luck!

1JMH, Bickford, RM1c, Jupiter, Fla.
1KAV, Cash, RM2c, Brooklyn, N. Y.
1KGN, Bourgeois, RM1c, South Weymouth, Mass.
1LHH, Pierce, Ens., address unknown.
1MWO, Star, address unknown.
1NMZ, Ertman, A/S, New Haven, Conn.
2FFN, Guida, Lt., Anacostia, D. C.
2JSY, Behrens, EM1c, Howard Beach, N. Y.

2LMW, Mentius, Lt., address unknown.
2OFY, Foster, ARM3c, Hackensack, N. J.
2OKE, Petrina, Atlanta, Ga.
3BPY, Phelan, Lt. Cmdr., Washington, D. C.
3EBB, Dieter, Ens., Key West, Fla.
ex-3FNI, Maciejewski, CRM, address unknown.
3HFO, Coppock, RM3c, Bainbridge, Md.
3HLH, Sears, CPO, Floyd Bennett Field, N. Y.
3ICK, Kaufmann, S2c, Camp Peary, Va.
3IXW, Butler, A/S, Baltimore, Md.
4DZL, Priester, RM1c, Fort Moultrie, S. C.
ex-4ESW, Bailey, Lt.(jg), Brunswick, Me.
4GKW, Smith, ARM2c, Boca Chica, Fla.
4GQX, King, S1c, Portland, Me.
4IGO, Cannon, Chicago, Ill.
5BGR, Porter, Ens., Muskogee, Okla.
5DHG, Tucker, Lt.(jg), Key West, Fla.
5GOV, Engles, Ens., Key West, Fla.
5JDR, McLin, S1c, College Stn., Tex.
5JYW, Margues, A/S, Farragut, Idaho.
5KOF, Grice, S2c, Michigan City, Ind.
ex-6CIY, Starbuck, Lt., Washington, D. C.
6GNV, Fox, Lt., Philadelphia, Pa.
K6MWX, Potier, RM1c, Bainbridge Island, Wash.
6PQE, Carmean, ARM1c, Floyd Bennett Field, N. Y.
6QIE, Johnson, RM2c, Annapolis, Md.
6QXJ, Kresge, EM1c, Camp Peary, Va.
6RLP, Wolf, A/S, Pasadena, Calif.
6RXJ, Barker, Ens., North River, N. Y.
6TFQ, Thormahlen, ARM1c, Floyd Bennett Field, N. Y.
6UMT, Lee, ARM1c, address unknown.
7DWG, Gibson, Ch. Pharm., Mare Island, Calif.
7GIL, Campbell, Ens., Kings Point, N. Y.
8LZK, McCullough, Lt.(jg), Norfolk, Va.
8NQQ, Satterfield, Lt., address unknown.
8UXV, Crum, A/S, Chicago, Ill.
8VKH, Dietterich, RM3c, Imperial, Pa.
8VQT, Russell, S2c, Bedford Springs, Pa.
8VQT, Herman, S2c, Port Hueneme, Calif.
8WJS, Yonker, Ens., Philipsburg, Pa.
9CVM, Sanderson, Ens., Brunswick, Me.
9IUQ, Embree, S1c, Anacostia, D. C.
ex-9IXZ, Price, Lt., Floyd Bennett Field, N. Y.
9MCL, Whitworth, RM3c, Fort Pierce, Fla.
ex-9NHB, Brown, S2c, Farragut, Idaho.
9NLT, Schleicher, Ames, Iowa.
9OP, Briggs, Lt., Key West, Fla.
9TLH, Wallace, A/C, Laramie, Wyo.
9SSU, Mulherin, Technician, S. Weymouth, Mass.
9VS, Miller, Lt., Arlington, Va.
9ZVT, Meyer, EM1c, Pt. Hueneme, Calif.

Operator's license only:

Haworth, S2c, Oaklyn, N. J.
Klane, A/S, Malden, Mass.
McDormand, ARM2c, Boca Chica, Fla.
Pantas, S2c, Bedford, Pa.
Paskin, S2c, Philadelphia, Pa.

**Sgt. R. A. Gauldin, W5CPC, entered the services in December, 1942, and has been stationed at Barksdale Field, La., in a signal service company. When we last heard from him he had just received word from "Local Board No. One" advising him that he had been deferred until September, 1943. He was wondering whether he should notify the draft board of his change of address. . . .**

Pehrson, RM2c, Oceanside, Calif.
Rowland, A/S, Ames, Iowa.
Walker, S2c, Camp Peary, Va.

## CIVIL SERVICE

1AHG, Wityak, SC, technician, Camp Murphy, Fla.
1BTG, Kennison, SC, engr., Belmar, N. J.
1DKD, Condon, FCC, inspector, Savannah, Ga.
1FRO, Fitzgerald, FCC, jr. monitoring officer, Watertown, Mass.
1GAE, Pratt, CAA, Boise, Idaho.
1ICO, Schaltenbrand, SC, technician, Boston, Mass.
1LBY, Kinsley, inspector, San Bernardino, Calif.
1LRQ, Wood, inspector, Franklin Park, Mass.
1NP, Gould, radio engineer, Belmar, N. J.
1NTW, Mackain, SC, radio mechanic, Westover Field, Mass.
2BXW, Spengler, inspector, New York, N. Y.
2FIK, Bizzoso, SC, technician, foreign duty.
2JIG, Field, SC radio engineer, Washington, D. C.
2JXJ, Hillman, SC, radio engineer, Ft. Monmouth.
2LPJ, Emrich, mechanic, New York, N. Y.
2MOV, Milstein, FCC, jr. monitoring officer.
2MPA, Rohrle, SC, Belmar, N. J.
2NKX, Beighley, FCC, jr. monitoring officer.
3BRF, Warnsmann, AAF, inspector, Baltimore, Md.
3DCG, Upshur, SC, engineering aide, Ft. Monmouth.
ex-3CKM, technician, Portsmouth, Va.
3FUG, Fierro, Chandler, Ariz.
3IJH, Sackman, CG, technician, Baltimore, Md.
3ITJ, Spangenberg, inspector, San Diego, Calif.
3JSR, Bishop, engineering aide, Norfolk, Va.
4BSL, Harley, radio mechanic, Corpus Christi, Tex.
4DIJ, Van Hooser, SC, inspector, Cincinnati, Ohio.
4FID, Bean, CAA, Atlanta, Ga.
4HSG, Spittle, SC, radio engineer, Rome, N. Y.

**Here is another pair of ham brothers wearing the uniform of their country — only these are twins and they're both serving in the Navy, somewhere in the Pacific. Robert W. Holmquist, RT1c, W1MBM, is on submarine duty, and Hugo W. Holmquist, RT2c, W1MWY, is with a PT squadron. The photograph was taken shortly after they enlisted in January, 1941, since which time both of them have seen some real action.**

5AA, Rea, CAA, radio engineer, Fort Worth, Tex.
ex-5AFB, Leonard, CAA, Anton Chico, N. M.
ex-5BQO, Price, SC, radio engineer, Ft. Monmouth.
5GJU, McFarland, FCC, Houston, Tex.
5GVK, Simons, CAA, Texarkana, Ark.
5HDN, Hicks, FCC, New Orleans, La.
5HFX, Wheeler, AAF, Oklahoma City, Okla.
5HH, Cherryhomes, AAF, Galveston, Tex.
5HJU, Whitaker, CAA, technician, Ft. Worth, Tex.
5HZN, Hornsby, AAF, instructor, Kelly Field, Tex.
5IOK, McArthur, AAF, instructor, Brookley Field, Ala.
5IXR, Edwards, CAA, Fort Worth, Tex.
5JJG, Barnes, SC, radio engineer, El Paso, Tex.
5KPX, Hall, SC, radio mechanic, Odessa, Tex.
6AWP, Smith, FCC, inspector, San Pedro, Calif.
6CZX, Quarteroni, SC, repairman, San Francisco.
6DLR, Wilson, CAA, electrician, Ogden, Utah.
6DPT, Burke, SC, March Field, Calif.
6DRE, Rawls, FCC, monitoring officer.
6IFR, Mori, USN, electrician, St. Helena, Calif.
6LLH, Drabble, AAF, radio mechanic, Ogden, Utah.
ex-6MBP, Willhite, AAF, inspector, Burbank, Calif.
6NEQ, Costa, radio mechanic, Alameda, Calif.
6POB, Fowler, SC, installation, San Bernardino, Calif.
6PPJ, Carter, AAF, mechanic, Colton, Calif.
6TLS, Chambers, SC, repairs, San Bernardino, Calif.
6UJE, Winters, AAF, radio mechanic, Pocatello, Idaho.
6UUQ, Wojcik, instructor, San Francisco, Calif.
7AHS, Miles, CAA, Boise, Idaho.
7DOH, Holmes, CAA, Boise, Idaho.
7FVZ, Powers, research work, Cambridge, Mass.
7FZK, Schultz, FCC, jr. monitoring officer.
7GDU, Whitlock, CAA, Boise, Idaho.
K7GNN, Sherry, CAA, foreign duty.
7HAZ, Munkres, CAA, Idaho Falls, Idaho.
7HFG, Robinson, inspector, San Diego, Calif.
7HRM, Robertson, CAA, Cheyenne, Wyo.
7IUW, Volk, SC, inspector, Chicago, Ill.
ex-8AWG, Thompson, SC, engineer, Belmar, N. J.
8BNG, Shepard, SC, radio mechanic, Romulus, Mich.
8CYN, Shoemaker, SC, radio engineer, Philadelphia, Pa.
8EXL, Allen, SC, inspector, Mansfield, Ohio.
8FLW, Corzatt, SC, inspector, Springfield, Mass.
8JEK, Gerard, inspector, Burgettstown, Pa.
8JUQ, Read, FCC, jr. monitoring officer.
8LQH, James, SC, technician, foreign duty.
8TX, Miskinis, Philadelphia Signal Depot.
9CCM, Kaufman, AAF, instructor, Madison, Wis.
9CUY, Stock, SC, inspector, Piqua, Ohio.
9CWR, Kangas, FCC, Grand Island, Nebr.
9DBW, Griffith, SC, Ft. Monmouth, N. J.
ex-9DH, Brackett, radio engineer, San Diego, Calif.
9DI, Bamer, AAF, instructor, Scott Field, Ill.
9EGY, Kessler, AAF, Truax Field, Wis.
9ESH, Monroe, SC, inspector, Newark, N. J.
9GKG, Long, SC, radio mechanic, Stuttgart, Ark.
9GLA, Mayer, engineer, Rapid City, S. D.
9JDS, Mitchell, CAA, foreign duty.
9KDJ, Worsham, SC, Luke Field, Ariz.
9LIU, Martin, SC, radio mechanic, Colorado Springs, Colo.
9MCV, Omdal, SC, instructor, Chicago, Ill.
9MDG, Belanger, FCC, Sault Ste. Marie, Mich.
9MPY, Kallstrom, SC, Colorado Springs, Colo.
9MQK, Walters, AAF, instructor, Madison, Wis.
9MUG, Rucker, AAF, inspector, San Bernardino, Calif.
ex-9MYY, Zyck, AAF, instructor, Scott Field, Ill.
9NMF, Devine, AAF, instructor, Truax Field.
9NPN, Chatlos, FCC, Chicago, Ill.
ex-9NQV, Van Arsdale, McLean, Va.
9NYB, Horton, CAA, Louisville, Ky.

9OFZ, Gartsman, inspector, Chicago, Ill.
9OKF, Geis, CAA, Watertown, S. D.
9OKI, Walker, SC, instructor, Baltimore, Md.
9OTJ, Hooper, Quincy, Ill.
ex-9PB, Barton, inspector, Indianapolis, Ind.
9PFB, Roeschke, inspector, Chicago, Ill.
ex-9PFG, Spoolman, inspector, Chicago, Ill.
9PJT, Rova, CAA, Bismark, N. D.
9PNX, Jauss, CAA, Lebo, Kan.
9PPO, Miller, AAF, inspector, Mission, Kan.
9PRZ, Haugen, electrician, Puget Sound Navy Yd., Wash.
9PXJ, West, inspector, Philadelphia, Pa.
9PYN, Knowles, AAF, instructor, Scott Field.
9QCP, Sterle, FCC, St. Paul, Minn.
9QFV, Krug, FCC, Providence, R. I.
9QIR, Polluconi, Washington, D. C.
9QIU, Enstrom, SC, inspector, Chicago, Ill.
9RED, Shawfrank, AAF, instructor, New Haven.
9REF, Fairhurst, SC, inspector, Ottumwa, Iowa.
9RFQ, Roberts, FCC, Grand Island, Nebr.
9RGG, Kelsey, technician, Dayton Signal Depot.
9RIP, Dworzack, CAA, Burlington, Iowa.
9RLB, Williamson, FCC, Detroit, Mich.
9RPJ, Beaudine, Sacramento Air Depot.
9RQU, Loomis, CAA, Cincinnati, Ohio.
9RT, Rosenman, instructor, Chicago, Ill.
9RYL, Morgan, CAA, foreign duty.
9SAI, Longstreth, CAA, North Platte, Nebr.
9SLJ, Kretschmer, AAF, instructor, Madison, Wis.
9SVB, Pautinen, Sacramento Air Depot.
9SWC, Rova, CAA, Minot, N. D.
9SXW, Hussey, inspector, Chicago, Ill.
9TPK, Schwaneke, AAF, instructor, St. Louis, Mo.
9TVO, Hall, CAA, Denver, Colo.
9UCQ, Sutton, FCC, Washington, D. C.
9UFT, Schroeder, AAF, instructor, Madison, Wis.
9UMN, Last, AAF, instructor, Madison, Wis.
9UNK, Caldwell, radio engineer, Palm Beach, Fla.
9UOD, Williams, AAF, Scott Field, Ill.
9UPT, Neppel, SC, radio mechanic, Douglas, Ariz.
9UTD, Fraushear, SC, Sacramento Air Depot.
ex-9UUI, Richards, radio engineer, Washington, D. C.
9UWG, Peterson, AAF, instructor, Chicago.
9UYP, Gombor, AAF, Patterson Field, Ohio.
9VOX, Gumm, radio operator, Omaha, Nebr.
9VSW, Millard, CAA, Wichita, Kan.
9VT, Potter, CAA, Watertown, S. D.
9VZX, Zieske, AAF, instructor, Madison, Wis.
9VYY, Herider, FCC, Lexington, Ky.
9WIV, Koropp, SC, Sacramento Air Depot.
9WJC, Park, AAF, Ft. Lauderdale, Fla.
9WMC, Deer, Terre Haute, Ind.
9WNF, Earl, SC, foreign duty.
9YAJ, Machin, AAF, instructor, Scott Field.
9YFR, Driver, FCC, Omaha, Nebr.
9YGC, Palin, inspector, Philadelphia, Pa.
9ZNM, Gardner, CAA, Ashley, N. D.
9ZXX, Johnson, FCC, Spokane, Wash.

Operator's license only:

Anderson, CAA, foreign duty.
Bailey, AAF, instructor, Sioux Falls.
Braatz, SC, Colorado Springs, Colo.
Buzzard, CAA, Burlington, Iowa.
Churchill, FCC, foreign duty.
Cox, FCC, asst. monitoring officer.
Eddy, SC, Newton, Mass.
Hargrove, SC, Dayton, Ohio.
Huberty, instructor, Tomah, Wis.
Isaacs, AAF, instructor, Scott Field.
Kirst, Navy Dept., Washington, D. C.
Kittel, FCC, Albuquerque, N. M.
Laande, CAA, Austin, Tex.
Marquardt, War Dept., Truax Field.
Meier, AAF, instructor, Sioux Falls.
Nelson, radio mechanic, Norfolk, Va.
Oncley, electrical engineer, Durham, N. C.
Peebles, SC, San Francisco, Calif.
Roistacher, AAF, instructor, Sioux Falls.
Shipman, FCC, Des Moines, Iowa.
Stiber, AAF, instructor, Sioux Falls.
Stone, SC, Rapid City, S. D.
Turner, CAA, foreign duty.
Underberger, SC, Sacramento, Calif.
Unthank, AAF, instructor, Sioux Falls.
West, AAF, instructor, Tuskegee, Ala.
White, electrician, Portsmouth, Va.
Willomitzer, radio operator, New York City.
Wright, Fort Peck, Mont.

## HAM HOSPITALITY

THERE are no bounds to the hospitality being extended to hams these days as their duties carry them to the far corners of the earth. Places which formerly represented DX contacts on the air are now more apt to be the destination of V-mail from home. And hams who are in these far-away places are finding that the friendly ham spirit is just as keen in personal QSOs as it ever was over the air. Hams are anxious to meet fellow hams of other nationalities, and many are extending cordial welcomes to those who may be in the vicinity.

James M. Strachan, ZL4AF, wrote us during a recent stay in Australia, commenting with considerable pleasure on the hospitality of the VKs. He concluded his letter by saying: "I would be pleased if hams visiting New Zealand could look me up." His address: 60 Searells Rd., Papanui, Christchurch, N. Z. (For ZL4AF's complete letter see Correspondence from Members, p. 67, in this issue.)

For those who may not have seen "Ham Hospitality" in December, 1943, *QST*, we repeat the invitation from Francisco Vita Sobrinho, PY7AX, of an open house to all hams whose duties take them to South America. His home is at Recife, Pernambuco, Brazil.

We also mention again that the City of Belfast YMCA Radio Club, GI6YM, will welcome visiting hams at their meetings, held every Wednesday evening at eight at Wellington Place (3rd Floor) Belfast. After visiting some of the GIs, Maurice Plasschaert, W9KQQ, wrote us: "That ham ticket is just like a pass for one swell time, and the boys here surely know how to give one."

For the benefit of hams who may be overseas, we list again several of the IARU societies whose officials have expressed the wish that hams and others in military communications work will call at the respective headquarters addresses shown below:

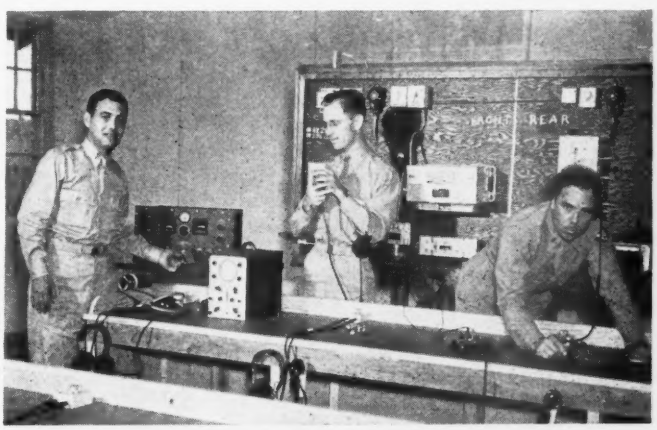
*Radio Society of Great Britain.* New Ruskin House, 28/30 Little Russell St., London, W. C. 1. Secretary, John Clarricoats, G6CL.

*Wireless Institute of Australia* 191 Queen St., Melbourne. (Box 2611W) Secretary, R. Anderson, VK3WY; or New South Wales Division at 21 Tunstall Ave., Kinsford, N.S.W. Secretary, W. Ryan, VK2TI.

*New Zealand Association of Radio Transmitters.* Box 489, Wellington. Secretary, F. Sellens, ZL2MY.

*Newfoundland Amateur Radio Association.* 88 Pleasant St., St. John's. Secretary, W. E. A. Nosworth, VO1S.

*Experimental Radio Society of Egypt.* Write Frank Pettit, Catholic Club, Mustapha Barracks, Sidi Gaber, Egypt; or phone Alexandria 27315 (SU1SG) or Ramleh 498 (SU1RD).



**A trio making good use of their ham backgrounds as radio instructors at the Waco, Tex., Army Air Field. Demonstrating some of the gear used in basic training planes are, *l. to r.*, Lt. David G. Cadena, W5FAR; Lt. Lee J. Kieth, W5MF, and Lt. Richard W. Fox, W9PTI. W5FAR was secretary of the San Antonio Radio Club at the time he entered the services.**

# Radio Aids to Avigation

## *A Description of Modern Airlines Equipment*

BY SGT. PETER K. ONNIGIAN,* W6QEU

**The growing importance of communications and aircraft navigational aids to airways operation is illustrated by the fact that ten years ago the expenditure for radio and allied communications equipment and maintenance on federal airways was only 20 per cent of the total, whereas now it represents more than 60 per cent of the cost of all airways maintenance and operation. In this article, the author describes the equipment and systems used by commercial airlines both for communication and navigation.**

THERE seems to exist in the minds of some much misguided information relating to the types of radio equipment carried by commercial aircraft and the use to which such equipment is put. It is the purpose of this article to attempt an explanation of the various radio units used by the commercial airlines and to show how these radio aids are necessary to avigation. The author assumes that the reader will draw a close parallel between these aids and the radio equipment used by our military aircraft. It must be remembered, however, that military aircraft carry much additional radio equipment which is used for combat and is not necessary for avigation.

The average commercial transport plane carries the following different units of radio equipment:

One communications receiver
One radio-range receiver
One automatic direction-finder receiver
Two marker receivers
One v.h.f. range receiver
One v.h.f. communications receiver
One glide-path receiver
One communications transmitter
One interphone system

The primary purpose of all radio equipment used in aircraft is the safety of life and property. The secondary purpose is the exchange of messages for proper continuance of the flight. These include messages for the Civil Aeronautics Administration (CAA), which is charged with supervising the proper operation of our aircraft transportation systems, as well as messages involving interests of the commercial airline company operating any particular flight.

All airlines have their own ground radio stations which contact their airplanes, both while on the ground and in flight, for the purpose of exchanging messages for the safe conduct of the flight. Planes in flight may communicate with the company ground stations to obtain information relative to their movements, or they may contact CAA radio-range stations or airport-control towers directly for this information. However, it is the usual practice, whenever possible, to contact the company ground stations, which in turn work with the CAA installations. This procedure provides the company with full information regarding the plane in flight and also gives the company dispatcher more control over the flight, especially during an emergency.

### *Aircraft Transmitters*

Aircraft transmitters vary in power output from a few watts to as much as 250 watts. The power ratings of military aircraft radio transmitters also vary, depending upon the type of work for which the airplane is designed. Generally speaking, pursuit aircraft have low-power transmitters while medium and heavy bombers have larger installations. There are two reasons for this: first, the smaller airplanes do not have the need for extremely long-distance contacts; and second, they have neither the space nor the personnel sufficient for the operation of such units. As a rule, bombers have regular crew members responsible for the proper operation of the radio equipment. The operators may be called upon to make long-distance contacts.

Commercial aircraft transmitters are usually of the crystal-controlled type. However, since it may be necessary to establish contact on any one of a hundred or more possible frequencies, some military transmitters are equipped with variable-frequency oscillators. Some transmitters are of the multi-channel type. Any one of ten frequencies may be obtained simply by the manipulation of a regular telephone-type dial. In this case transmitter frequencies are crystal controlled. Transmitters as well as receivers usually are made up of individual units, not too heavy in weight, to make servicing easier. Thus different units may be replaced without the necessity for removing a complete transmitter or receiver. Commercial transport planes usually have a crew of three: pilot, co-pilot and stewardess. In general, most of the radio operating is done by the co-pilot.

### *Aircraft Receivers*

Most communications receivers also are equipped with dial switching systems for frequency changes. The same switching device which switches the

* 1st Communications Squadron, McClellan Field, Calif.

transmitter also switches the receiver, the oscillator of which is crystal controlled. The receiver is pre-tuned and set exactly to the proper receiving frequency. The receiver signal-to-noise ratio must be very high, since QRM and QRN combine to make very heavy competition. The received signals are not very strong at times and, since the contact may be very important, sensitivity must be good at all times. Because signal strength varies a great deal the audio output must be fairly constant, since the pilot cannot take time to adjust the gain control frequently. The airplane may be within 100 feet of the transmitter at one moment and 200 miles away within the next hour. A very complete automatic volume control has the disadvantage that the sensitivity is maximum, and therefore the noise greatest, when no signal is being received. However, satisfactory compensation is provided by the use of a good noise limiter or suppressor operated by the carrier of the station being received.

Audio output is very low compared with that provided in ground-station installations. There is no great need for high power from the receiver, however, since it is used only to feed two pairs of headphones. The frequency response is cut down so that it is limited to a more or less flat range of 250 to 2500 cycles. This is permissible because the higher and lower frequencies do not add materially to the intelligibility of the signal, while restriction of the audio range cuts out a certain amount of noise.

### *Frequencies*

Operating frequencies used for commercial radio circuits extend from approximately 6 Mc. to about 3 Mc. The 6-Mc. band was chosen because of its reliability for medium distance contacts during the day. Because conditions of severe skip may be encountered during night operation at this frequency, the lower frequencies are used in periods of darkness. A long-distance aeronautical band at a still higher frequency recently has been put into use over some circuits. This band lies at approximately 9 Mc. It is not used for short-distance contacts, being unsatisfactory for this purpose because of skip characteristics.

### *Airplane Antennas*

The efficiencies of most aircraft antennas approach those obtained with ground installations. Earlier antennas for aircraft use consisted of a long trailing wire. A heavy weight is attached at the free end of the wire to keep the antenna in a more or less vertical position. While this system is still used for long-distance or low-frequency work, it has many disadvantages. The long wire must be reeled in manually before landing, and if the pilot forgets to do this he loses his antenna — and usually more!

Next came the short vertical mast with top loading provided by guy wires. The use of this type is still popular in some of our military basic trainers. Now, however, a long wire attached to a feed-through insulator in the top of the fuselage and running to the top of the fin is used for transmitting and receiving in more than 90 per cent of the aircraft in operation. Most airplanes have sufficient room for two such antennas.

Another system makes use of the shunt-excited antenna. One of the wings or a member of the tail assembly forms the antenna, which is shunt fed with a single-wire 600-ohm transmission line. This has the disadvantage that the feed line is susceptible to icing; however, if the line is not too long this condition usually can be tolerated.

### *The Radio Range*

In these modern times airplanes follow definite routes or courses between airfields or cities. These routes are laid out by CAA in this country, and are defined by the radio beacon, more commonly referred to as the *radio range*. Although first patented by the British Marconi Company in 1909 and developed later by the U. S. Signal Corps it did not find commercial acceptance and use until the autumn of 1927, when the first radio-range airways system, between New York and Bellefonte, Pa., was inaugurated.

Radio-range antenna systems are designed to produce special radiation patterns. An examination of the horizontal radiation fie d pattern of a half-wave antenna in free space is helpful in understanding how these special patterns are obtained. It is well known that maximum current is induced in a half-wave receiving antenna only when the approaching wave strikes the antenna along a path at right angles to the direction of the antenna. In the transmitting case, maximum radiation takes place at right angles to the direction of the antenna, as shown in Fig. 1. At other angles the field-strength amplitudes are in

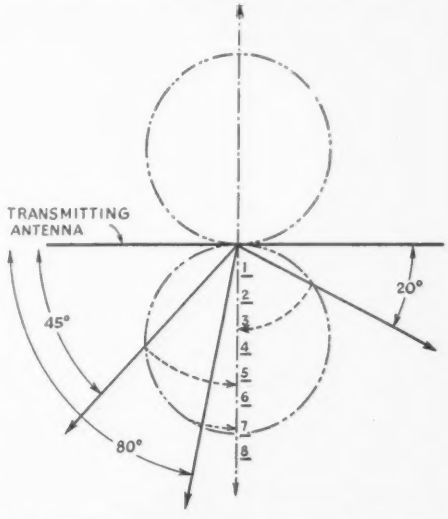



*Fig. 1* — **Horizontal half-wave antenna, showing relative and arbitrary field-strength values at various horizontal angles. Relative field strength for any angle may be computed graphically by plotting values on vector bisection with field pattern and 90-degree value. These values will be only approximate, since the fields for a half-wave antenna are not perfect circles as shown.**

proportion to the cosine of the vector angle. Relative field strengths for the angles of 20, 45 and 80 degrees are indicated in Fig. 1. The pattern of a loop antenna has much the same characteristics, although maximum useful radiation is vertically polarized and takes place in the direction of the plane of the loop, instead of at right angles, so long as the circumference of the loop is equivalent to a very small fraction of the operating wavelength.

The radio range makes use of two such radiating elements placed at right angles to each other. In this case, 45-degree lines from both antennas coincide, as shown in Fig. 2, when both are driven with the same power. If a field-strength meter is placed anywhere along one of these 45-degree lines, and the loops are energized alternately, the field-strength meter will indicate the same strength regardless of which antenna is radiating. This is an important point in the operation of the radio range. If each carrier is tone modulated a steady note without interruptions will be heard. If, however, the receiving apparatus is moved to any other position, the signal from one loop will be louder than that from the other. For instance, if the receiver is at a point along a line making an angle of 80 degrees with the plane of Loop No. 1 the signal from this loop will be the louder, since the receiving position is also along a line making an angle of 10 degrees with Loop No. 2 where the field strength from Loop No. 2 is much weaker.

In practice the courses appear to be wider as the distance from the range station increases. The angle over which the signal is steady is considered to be about 3 degrees wide. In addition there will be two "twilight" zones of 3 degrees on either side of the steady-signal course, throughout which the difference in signal strengths will be small. Outside these zones the difference in signal strengths will be pronounced. So that the signals




*Fig. 2* — **Field pattern obtained with two half-wave antennas at right angles, the antennas being energized alternately. Paths where equal signals will be obtained are indicated. The two horizontal antennas may be replaced by four vertical antennas of the tower type.**

from each of the loops may be identified they are keyed differently, one with the letter "N" and the other with the letter "A." The keying is timed so that the characters overlap, the dot of each letter occurring during the space between the dot

*Fig. 3* — **Graphic representation of the overlapping of the "A" and "N" signals to form a continuous steady signal along the range course bearing.**

and dash of the other, as indicated graphically in Fig. 3. Thus a receiver located directly along one of the courses will pick up a continuous tone resulting from the combination of the two signals. With the receiver at any other point, either the A or the N will be sufficiently distinct to make it possible for the pilot to determine to which side of the course he has strayed and to correct his flight direction accordingly.

### *Night Effect*

Unavoidable horizontally polarized radiations from the horizontal members of ordinary loop antennas are responsible for multiple-path signals which result in fading signals at the receiver during hours of darkness. Since it is apparent that the course indication at the receiver depends upon the relative strengths of signals received from the two loops, it is evident that the fading of one signal at a different rate than the other will result in a change of the path along which equal-strength "on-course" signals will be obtained. This phenomenon is known as "night effect" and is responsible for an apparent erratic shifting in the course indication. The effect may be almost entirely eliminated by the use of vertical radiators which confine the radiation to low angles. This type of range, known as the TL range, is employed universally in the United States. To produce an equivalent pattern of "figure-eights," four steel towers at the corners of a square are used as vertical radiators, as shown in Fig. 4. Diagonally opposite towers are excited simultaneously but in opposite phase. The towers are limited to a height of between $\frac{1}{40}$ and $\frac{1}{20}$ wavelength, since higher towers not only would offer a hazard to aircraft landing and take-off at the near-by airport but would also require guy wires whose presence might alter the radiation pattern. The towers are insulated from ground and are series-fed by means of buried concentric lines, to eliminate line radiation. Radio-range transmitters have an output power rating of 275 watts.

### *Course Shifting*

It is obvious from the foregoing that a single radio-range station may serve to guide aircraft to and from an airport along four different courses. However, the desired courses may not coincide with the 45-degree radio courses which have been under discussion. It is often desirable to shift one or more of the radio courses to cover desired paths of flight between airports. Since radio-range courses fundamentally are areas where the

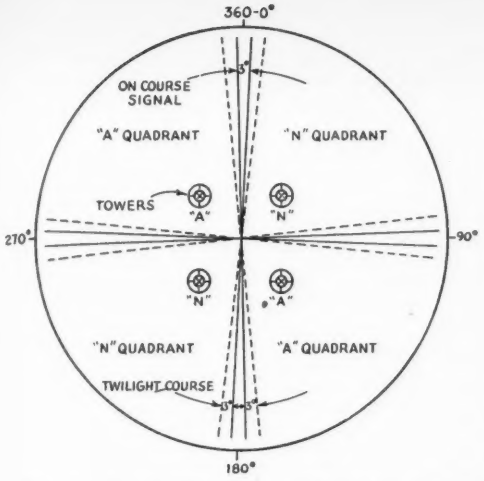



*Fig. 4* — **In the TL type of radio range beacon, four vertical tower antennas are used. The "on-course" and "twilight" signal areas are indicated.**

strengths of two signals from the range station are equal in intensity, it is clear that, if the strength of the signal from one set of towers is decreased, the new resultant course will be shifted toward the weaker quadrant. If means is provided whereby the power to each of the four towers may be varied the courses can be bent to almost any desired angle, as illustrated graphically in Fig. 5. This is usually accomplished by the insertion of resistance in such a way as to reduce the power radiated by any one tower. This is done without disturbing either the power radiated by the other towers or the phase of the currents in these towers, which obviously would also cause a shifting of the course.

Although the chief purpose of the radio-range station is to provide guidance for aircraft, it serves also for the transmission of weather information, either on schedule or in response to a special request by the aircraft operator. At one time the momentary loss of the range signal necessary to receive this information via the air-ground channel was not considered dangerous. However, the high speed of modern airplanes and the fact that the range signal is put to other uses than mere course indication now combine to make interruption of the range signal even for a period as short as ten seconds of possibly serious consequence at a critical moment.

Accordingly, a system has been devised which permits simultaneous transmission of voice and range signals, with the selection of either available to the pilot. To accomplish this, a fifth tower antenna is added at the center of the square formed by the four range towers. This tower is fed by a separate un-keyed 400-watt transmitter whose frequency is 1020 cycles lower than the frequency of the range transmitter. This steady signal beats with the keyed range signal to produce a 1020-cycle tone in the output of the range receiver, thus obviating a tone-modulated range signal. A filter in one of the speech stages cuts out any 1020-cycle energy which may be present in the voice signal. This, of course, has no noticeable effect upon the voice quality.

When the receiver in the aircraft is set for range-signal reception, a filter in the audio section cuts out all frequencies except the desired 1020-cycle beat. When the operator wishes to listen for voice transmissions, this filter is switched out and another, which passes all voice frequencies except 1020 cycles, is switched in. Thus the range signal is interrupted only at the discretion of the aircraft operator.

### *Range Receiver*

The antenna used with an aircraft range receiver must be well chosen, since otherwise it may introduce serious course errors. Because these errors may be caused in part by any horizontal portion of the antenna, every effort is made to reduce horizontal antenna polarization to a minimum. In modern high-speed planes a high vertical mast represents an aerodynamic problem. Also, banking at rather steep angles on turns places the aircraft antenna in a more or less horizontal position. When this occurs near an airport, as it often does, course errors are increased just at the very time when accuracy is most needed.

Several different types of antennas have been developed which overcome both problems. A balanced "T" flat top, added to the vertical antenna in such a manner that it is at right angles to the line of flight, will actually increase vertical polarization when the plane is in a bank, although icing difficulties are increased. A much better type of antenna developed by one airline is known as the "V" antenna. Not only does it possess characteristics which tend to maintain vertical polarization regardless of the position of the plane, but it is better also from an aerodynamic standpoint. This type of antenna is placed close to the bottom of the fuselage, near the nose. The lead-in runs from the apex of the angle formed by the legs of the "V," which is approximately 90 degrees. The lead-in and the

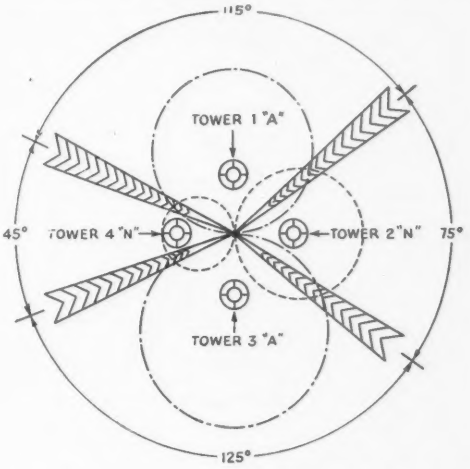



*Fig. 5* — **Sketch illustrating the principle by which radio range courses are bent to give a desired bearing.**

legs of the "V" each are about 6 feet in length. For frequencies between 200 and 400 kc. the antenna is highly capacitive. Iron-core impedance-matching transformers are used to couple both the "V" and the receiver to a low-impedance line. This helps to minimize ignition noise.

The radio-range receiver is usually of the superheterodyne type, since selectivity and gain are of paramount importance. A single r.f. stage is usually followed by a converter feeding a two-stage i.f. amplifier tuned to 180 kc., which is about half the operating frequency. The second detector is of the biased-diode type. The audio section delivers about 50 milliwatts to two pairs of headphones. Frequency response is not at all flat; in fact, it varies about 5 db. over the range of 200 to 2000 cycles. Frequencies on both ends of this range are cut out to help reduce noise. The voice and range-tone filters already described are included in this section. The range receiver usually has a sensitivity rating of about 1 microvolt for an output of 50 mw. and weighs about 20 pounds, including the dynamotor power supply. It is, of course, only one of the several radio receivers carried on a modern transport airplane.

### *Instrument-Landing Systems*

In order to make a landing it is necessary for the pilot of the aircraft to know his exact position in relation to the landing strip which he is approaching. Ground fog or a low ceiling may make it impossible for the pilot to see his objective. Reliance then must be placed upon instruments for landing.

The Bureau of Standards saw the need for a method of making instrument landings back in 1929, and in that year started the development of a system using radio waves as the guiding means. At present the federal government has approximately 18 airports equipped for instrument landing. During the early stages of development many difficulties were encountered.

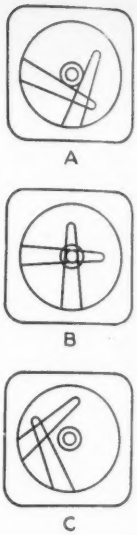



*Fig. 7* — The pilot's indicator operates from the output of two special receivers, one tuned to the "glide-path" transmitter, the other to the "localizer" transmitter. The latter serves to operate the vertical pointer, while the former energizes the horizontal pointer.

Most of these now have been ironed out with practical application, but even today the system is not entirely foolproof. Several other systems have been devised in recent years, each having its own particular advantages.

Since aircraft operate in three-dimensional space, instrument landing requires three essential types of radio-guiding devices. One of these is a low-power transmitter called the "localizer." It is placed at one end of the runway. Radiation from its antenna system is confined to a narrow beam down the center of the landing strip. This serves to operate an indicator on the instrument panel, showing whether the plane is approaching to the right or left of the center line of the landing strip. Another device, called the "glide path," consists of a transmitter and radiating system which concentrates energy about an axis making a vertical angle of about 20 degrees with the surface of the runway, as illustrated in Fig. 6. Radiation in the horizontal plane is limited to about 45 degrees. "Marker" transmitters, spaced along the length of the landing strip, serve to give the pilot an indication of his position in relation to the end of the runway.

The dashed lines of Fig. 6 show a typical field-strength pattern for the glide-path antenna. The lines will be recognized as paths which would be followed in maintaining a constant reading on a field-strength meter as the meter is moved closer to or farther away from the transmitting antenna. By selection of any desired field-strength, the pilot may approach the landing strip at the angle of the corresponding isopotential path merely by maintaining a constant field-strength reading on his indicator.

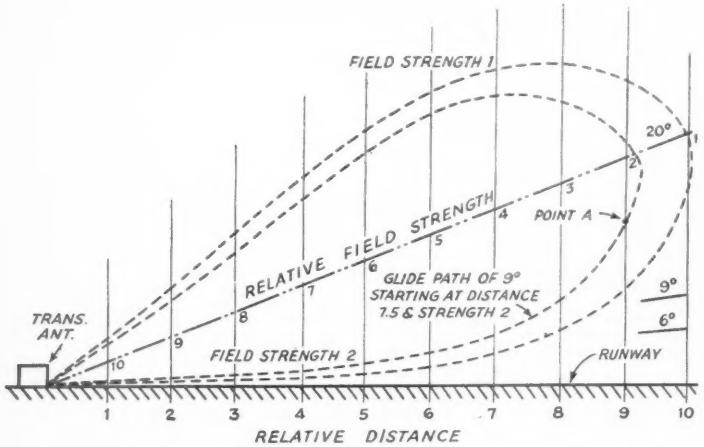



*Fig. 6* — Vertical field-strength pattern of a glide-path installation for "blind" landings. The glide path may start at any angle, the pilot maneuvering to maintain a constant receiver signal strength throughout the glide.

In practice, the pilot approaching an airport to make a blind landing lines up his plane on the localizer path while still several miles from the airport. He then maneuvers so as to pass over an outer marker at some standardized altitude. From the outer marker on in to the land-

(*Continued on page 92*)

# HAPPENINGS OF THE MONTH


### POSTWAR PLANNING

OUR Headquarters correspondence shows some uneasiness over the future of amateur radio, an understandable lack of knowledge of what the processes of reactivation will be, uncertainty whether the League is on the job, wonderings whether we should contemplate high-power publicity campaigns and formal lobbying, and so on. There are of course many factors in this situation. We report the following for your information:

The directors and officers of ARRL are keenly alert to the situation. The League maintains its contacts with official Washington through several representatives. The Planning Committee of the ARRL Board of Directors is meeting in Washington in mid-January to polish up its recommendations to the Board. Board policy has already been stated: it calls for the return of prewar amateur frequencies, plus new harmonic bands as far up into the spectrum as allocations are made to specific services.

The panels of the Radio Technical Planning Board are also at work. ARRL is represented. This is an industry agency, civilian, and will be somewhat handicapped by lack of knowledge of military requirements and of secret developments. It will serve the very useful purpose of reconciling conflicting industry points of view but is to be regarded perhaps primarily as the spokesman for the set-builders and the broadcasting industry. It will not be the determining factor in postwar arrangements affecting amateurs.

It has now become public information that for some months past there has been a considerable group of government representatives at work studying postwar communications in Washington. Remembering that radio is a world-wide matter on which international agreements are frequently necessary, it is logical to find this work occurring under the aegis of the Department of State and under the general chairmanship of Assistant Secretary of State Breckenridge Long. Participants include experts from every government agency concerned with communications, not only the armed forces and other government bureaus but also both houses of Congress. This is the real thing; here is where the determinations will be made. So far there has been no public participation in the work. It may be confidently expected that that will come at the proper time, embracing consultation with RTPB and other factors in civilian radio, including ourselves. This is the traditional way in which these things are worked out. Thus it is now apparent that a government mechanism has been set up for the orderly determination of postwar radio matters, in accordance with democratic processes. We find this altogether reassuring, a feeling in which we are strengthened because there is no place in Washington where we have moved that we have not found full appreciation of the value of amateur radio as a national institution and an awareness of what the American ham is doing in the war. We do not know what difficulties will yet be found, but at this time we can face the future with confidence.

We shall continue to keep you posted from time to time in *QST*.

### PROOF-OF-USE AGAIN WAIVED

JUST a little item to keep the record straight: You will remember that in the old days you couldn't get a renewal of your licenses unless you could prove that you had used them. Then the war came and FCC found that both commercial and amateur operators experienced difficulty in making a showing of service or the use of their licenses; so they temporarily waived the requirement for proof of use. That order, as once extended under the number 77-B, was due to expire on January 1st.

But now FCC has adopted a further order, this one called 77-C, continuing to suspend this requirement until further order of the Commission but not beyond January 1, 1945, unless the order is still further extended.

Since all of our amateur operator licenses are extended at least until next December, the matter has only academic interest for us now. Thereafter it may be important.

### AMATEUR EXAMINATIONS

FCC continues to issue amateur operator licenses and the FCC examinations therefor are still being given, even though amateur station licenses are not issued during the war. The military services recognize the possession of an FCC amateur operator license as attesting a degree of proficiency in radio which is definitely interesting to them. And many hundreds of wartime radio students, with an eye to amateur operation after the war, are taking out amateur op tickets.

The League also advises its members that it is continuing the publication of *The Radio Amateur's License Manual*, with revisions as frequently as necessary, to prepare students for this examination. The *License Manual* gives details of the procedure for taking out a license and for modification and renewal, explains the scope of the exams, presents typical paraphrased questions and answers, and contains a complete text of the FCC regs governing amateurs.

FCC announces that it will give amateur examinations during 1944 on the following schedule. Remember this list when you need to know when and where examinations will occur. Where exact dates or places are not shown below, information

may be obtained, as the date approaches, from the Inspector-In-Charge of the district. An asterisk (*) indicates that the examination dates shown are subject to change and should be verified from the inspector as the date approaches. No examinations are given on national or state holidays. All examinations begin promptly at 9:00 A.M., local time, except as noted below:

Albuquerque: Mar. 24th, Sept. 22nd.
Allegan, Mich., P. O. Box 89: By appointment.
Atlanta, 411 Federal Annex: Tuesdays, Fridays and Saturdays at 8:00 A.M.
Baltimore, 508 Old Town Bank Bldg.: Wednesdays and Saturdays; other days by appointment.
Bangor, Me.: Apr. 18th* and Sept. 12th.*
Beaumont, Tex., 329 Post Office Bldg.: Thursdays.
Birmingham: Jan. 21st, Apr. 21st, July 21st, Oct. 20th.
Billings, Mont.: Apr. 20th* and Oct. 7th.*
Bismarck, N. D.: Some time in April and October.
Boise: Apr. 22nd* and Oct. 21st.*
Boston, 7th floor Customhouse: Daily except Thursdays.
Buffalo, 328 Federal Bldg.: First and third Saturdays of each month.
Butte, Mont.: Apr. 18th* and Oct. 5th.*
Charleston, W. Va.: Some time in March,* June,* September* and December.*
Chicago, 246 U. S. Courthouse Bldg.: Saturdays.
Cincinnati: Some time in February,* May,* August* and November.*
Cleveland, 541 Old P. O. Bldg.: First and third Saturdays of each month; other days by appointment.
Columbus, Ohio: Some time in January,* April,* July* and October.*
Corpus Christi: June 10th and Dec. 9th
Cumberland, Md.: Apr. 14th and Oct. 14th.
Dallas, 500 U. S. Terminal Annex: Tuesdays and Saturdays.
Davenport, Ia.: Some time in January, April, July and October.
Denver, 504 Customhouse: First and second Saturdays of each month.
Des Moines: Jan. 8th, Apr. 8th, July 8th, Oct. 14th.
Detroit, 414 New Federal Bldg.: Saturdays.
Fort Wayne: Some time in February, May, August and November.
Fresno: Mar. 15th,* June 14th,* Sept. 20th,* Dec. 15th.*
Galveston, 404 Federal Bldg.: Wednesdays, Fridays and Saturdays.
Grand Island, Nebr. (P. O. Box 788): By appointment.
Grand Rapids: Some time in January,* April,* July* and October.*
Hartford, Conn.: Mar. 18th* and Oct. 28th.*
Hilo, T. H.: Jan. 10th and Aug. 16th.
Honolulu, 609 Stangenwald Bldg.: Mondays and Saturdays at 8:30 A.M.
Huron, S. D.: Some time in March, June, September and December.
Indianapolis: Some time in February, May, August and November.
Jacksonville: May 11th and 12th, Nov. 9th and 10th.
Juneau, Alaska, 7 Shattuck Bldg. (P. O. Box 1421): By appointment.
Kansas City, 809 U. S. Courthouse: Saturdays.
Kaunakakai, T. H.: Aug. 3rd.
Kingsville, Texas (P. O. Box 632): By appointment.
Lanai City, T. H.: Aug. 9th.
Lihue, T. H.: Feb. 7th and Aug. 30th.
Little Rock: Jan. 12th, Apr. 19th, July 12th, Oct. 11th.
Los Angeles, 539 U. S. P. O. & Courthouse Bldg.: Wednesdays and Saturdays.
Memphis: Feb. 23rd and Aug. 23rd.
Miami, 312 Federal Bldg.: Mondays and Fridays.
Milwaukee: Some time in January, April, July and October.
Mobile: May 23rd and Nov. 21st.
Nashville: Feb. 18th, May 19th, Aug. 18th, Nov. 17th.
New Orleans, 400 Audubon Bldg.: Mondays at 8:30 A.M.; other days by appointment.
New York City, 748 Federal Bldg., 641 Washington St.: Tuesdays, Thursdays and Saturdays.
Norfolk, 402 New P. O. Bldg.: Class A, daily; Class B, Fridays and Saturdays.
Oklahoma City: Jan. 27th, Apr. 27th, July 27th, Oct. 26th.
Omaha: Apr. 15th and Oct. 7th.
Philadelphia, 1200 Customhouse: Wednesdays and Saturdays.
Phoenix, Ariz.: Apr. 29th* and Oct. 28th.*
Pittsburgh: Feb. 12th,* May 13th,* Aug. 12th,* Nov. 10th.*
Portland, Me.: Apr. 22nd* and Sept. 16th.*
Portland, Ore., 805 Terminal Sales Bldg.: Fridays and Saturdays at 8:30 A.M.
Reno: Apr. 19th* and Oct. 18th.*
Roanoke, Va.: Apr. 1st and Oct. 7th.
St. Louis: Feb. 12th, May 13th, Aug. 12th, Nov. 11th.
St. Paul, 208 Uptown P. O. & Federal Courts Bldg.: First and third Saturdays of each month.
Salt Lake City: Mar. 26th* and Sept. 24th.*
San Antonio: Feb. 24th, May 25th, Aug. 24th, Nov. 23rd.
San Diego, 307 Customhouse & Courthouse Bldg.: By appointment.
San Francisco, 328 Customhouse: Mondays and Saturdays at 8:30 A.M.
San Juan, P. R., 322 Federal Bldg. (P. O. Box 2987): By appointment.
Savannah, 214 Post Office Bldg.: By appointment.
Schenectady: Mar. 16th* and 17th,* June 15th* and 16th,* Sept. 14th* and 15th,* Dec. 14th* and 15th.*
Seattle, 808 Federal Office Bldg.: Fridays.
Spokane: Apr. 13th* and Sept. 30th.*
Syracuse, N. Y.: Jan. 8th,* Apr. 15th,* July 8th,* Oct. 14th.*
Tampa, 203 P. O. Bldg.: Where code test required, by appointment only; Class A without code test, daily.

## AMATEUR WAR SERVICE RECORD

*Name*

*Present mailing address*

*Rank or rating*

*Branch or bureau: Signal Corps, AAF, Buships, WAVES, etc. If civilian industry, give title and company.*

Call, present or ex; or grade of op-license only

**SERVICE**

- ☐ Army
- ☐ Navy
- ☐ Coast Guard
- ☐ Marine Corps
- ☐ Maritime Service
- ☐ Merchant Marine
- ☐ Civil Service
- ☐ Radio industry, 100% war

Wailuku, T. H.: Aug. 4th.
Washington, D. C., 410 International Bldg., 1319 F St., N. W.: Daily except Saturdays.
Wichita: Mar. 17th and Sept. 15th.
Williamsport, Pa.: May 9th* and Nov. 7th.*
Winston-Salem: Feb. 5th, May 6th, Aug. 5th, Nov. 4th.

### AMATEUR WAR SERVICE RECORD

EVER hear of an AWSR? It's the expression we use at Headquarters for the record of war service by amateurs which we are compiling, now filling many card files. You know why we want it: to assemble the data on what the hams did in the war, so that we can show that we are entitled to be restored to the air. Are *you* in that record? If you are a radio amateur of the United States or Canada, and are devoting your talents during this war to any aspect of radio work, we request that you register pertinent data with us by means of the form at the bottom of the facing page (or a postcard reproduction of the essential part). This applies equally to men in uniform and to those in essential auxiliary services, the wartime Civil Service, and in industry which is fully devoted to war work. It will be very helpful if you not only make sure that we have the data on you but let us have similar information on any of your amateur buddies about whom you know. If you know about so many of them that listing them in a letter is a chore, tell us how many and we'll gladly send you some of our form cards.

**ARE YOU LICENSED?**

**When joining the League or renewing your membership, it is important that you show whether you have an amateur license, either station or operator. Please state your call and/or the class of operator license held, that we may verify your classification.**

# Hamfest in North Africa

***By Lt. Harry Longerich,* W2GQY, and M/Sgt. Arthur Hansen,* W8MTE***

DURING a routine inspection of a radio system by several officers of the U. S. Signal Corps somewhere in North Africa, the officers, all of whom were hams, were swept off their feet to learn that their erstwhile guide was none other than G6ZO, formerly from Scotland and an ardent DX man. Of course, as every ham knows, the conversation soon drifted to the subject nearest and dearest to their hearts. G6ZO proved to be a genuine ham in all respects, even to the extent of lugging copies of *QST* and his logbook all over the Dark Continent.

The following week an informal hamfest was held under his sponsorship. All U. S. Districts except W1 and W3 were represented, and several

**The hamfest in North Africa was well attended, as may be seen from the above photograph. *Front row, l. to r.:* W7IQP, W6BV, W2GQY–ex-K6SRZ, W8QUO, W8MTE, W8SIF, and SWL Zoll. *Middle row l. to r.:* W5IUW, SWL Hubbard, W9QAX, W6SCW, W8QIB, W7HPQ, W9PLD, and SWL Petersen. *Rear row, l. to r.:* W8NOH, W2JYM, W4EKA, G3CK, BRS5202, CN8AV, BERS187, G2AMG, and the host, G6ZO.**

Gs and a CN8 also participated. While most of those present were in the Signal Corps, the Navy was represented by W8NOH — who, incidentally, had to come all the way to North Africa to meet the other half of many of his 75-meter contacts, W8MTE. W9DZP, known to all here as the second biggest liar in the Signal Corps, was unable to be with us due to the nature of his work, but rendered valuable aid in making the hamfest possible.

The evening started out, as all good hamfests do, with a get-together session. Thereafter followed talks on rhombic antennas by G6ZO and G2AMG, and one on postwar amateur radio by W6BV. CN8AV gave a talk on radio conditions in general, and many of us were surprised to learn of all the difficulties that seem to beset a ham in North Africa.

A recess was declared for refreshments and, thanks to the ever thoughtful G6ZO, sandwiches, tea and cakes were served. All of this time, of course, little sub-hamfests were going on among the various table partners. Some of us had come all the way to North Africa to meet fellows we had worked many times back home, but had never met in person.

Many of us formerly on the W side of the pond often had wondered what an European ham's logbook looked like. Well, all of us had an opportunity to examine that of our host, G6ZO. This log was an amazing example of contacts over a period of several years. Such a document was a real treat and brought back happy memories of days gone by. G6ZO worked the world with a power of 25 watts. In common with many continental hams he had to make something else do besides power, and as a result he had specialized in antennas.

The hamfest was climaxed by the inspection of a rig with a kilowatt final fed by a 50-kw. Diesel. Everywhere apparent to the eye was some piece of ham equipment, and we were indebted to W5IUW for this pleasant atmosphere. Such a display of ham gear most of us hadn't seen since that fateful day back in December, 1941.

*APO 512, c/o Postmaster, N. Y. C., N. Y.

# A WERS Handie-Talkie for $1538.77

***A Compact Hand-Portable Unit For On-the-Spot Work***

BY FREDERICK A. LONG,* EX-W8NE, EX-W8BSL

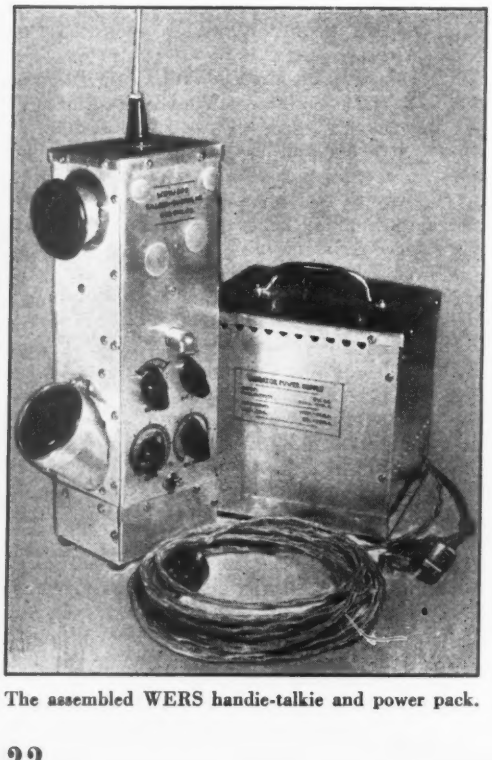
**This article describes a unit of the "handie-talkie" type for WERS work in which several perplexing design problems have been solved in ingenious fashion. Not only is the unit compact and practical from the operating standpoint — but it works! With it the author has carried on repeated R9 QSOs over distances of 10 to 12 miles.**

THE published material on the design of "handie-talkies" leaves much to be desired. First, there is little such material available; second, in no single case does there appear to be a combination of solutions for the major problems facing the constructor of compact units for WERS use. Because of the inherent instability of the transceiver circuits generally used and the necessity for retuning when alternating between receiving and transmitting, a transmitter-receiver arrangement seems advisable even for units which must be sufficiently compact to be carried in the hand. Another problem is the design of a convenient antenna change-over switch having minimum loss and size. Other problems center about controls, size and weight, effective power, source of power supply, and over-all cost.

### *Circuit Details*

Fig. 1 shows the fundamental circuit of a unit constructed to answer these problems. The transmitting end uses an ultraudion oscillator with series-fed plate, designed for either an HY114-B or an HY615, depending upon the power supply

* 46–41 Forest Drive, Douglaston, L. I., N. Y. Borough Radio Coördinator, Queens County.



The assembled WERS handie-talkie and power pack.

available. Here, and elsewhere in the diagram, the dotted lines lettered $A_1$ to $A_8$, principally cathode connections and changes in filament leads and audio plate leads, represent the only circuit alterations necessary in converting from 1.4-volt tubes to 6.3-volt cathode-type tubes.

The receiver employs a simple self-quenched superregenerative detector with either an HY114-B or an HY615, separately resistance-coupled to the first audio stage to eliminate volume-control problems involved in switching from receiving to transmitting. Reduction of the number of controls is achieved by the use of a fixed-tuned transmitter tank circuit, $L_3C_3$, and pre-setting of the speech output at optimum level. The capacitive coupling of the transmitter to the antenna and the inductive coupling between detector input and antenna are also preset at fixed positions. As a result, after preliminary adjustments have been completed, only four controls are required: receiver tuning, regeneration, audio volume, and change-over switch.

Of these, the controls for receiver volume, $R_4$, and regeneration, $R_6$, seldom will need adjustment during any one operating period. When operating on spot frequency the change-over switch remains the only control required for good operation. This switch is made up in two sections, one ($S_1$) taking care of the antenna and the other ($S_2$) making the necessary changes in the audio circuits. The shafts are linked mechanically to a single control.

The audio system for dual application in a transmitter-receiver combination involves special design problems. Tubes were selected which would give optimum performance without the necessity for using biasing voltage in either of the two audio stages. Class-B operation was adopted in the output stage in order to minimize battery drain. The two sections of the 1G6GT dual triode are connected in parallel as a Class-A driver, while another similar tube is used as a Class-B output amplifier or modulator for straight battery operation. When more power is required and vibrapack or a.c. supply is available, 6N7GTs may be substituted with the circuit changes in-

dicated in the diagram. $R_7$ and $R_8$ form a voltage divider to reduce the plate voltage applied to the driver stage. A separate switch, $S_4$, is provided to cut out the panel light when it is necessary to limit current drain to a minimum.

For coupling the driver stage to the Class-B stage, the RCA "paraphase" circuit was first tried as a simple method of phase inversion. The required resistors and condensers occupy less space and are lighter than a driver transformer, and they can be more conveniently located in the available space. The results were satisfactory, so far as the receiver is concerned, since only a single headphone is used at the output. For transmission, however, the arrangement did not furnish quite the desired amount of drive for the

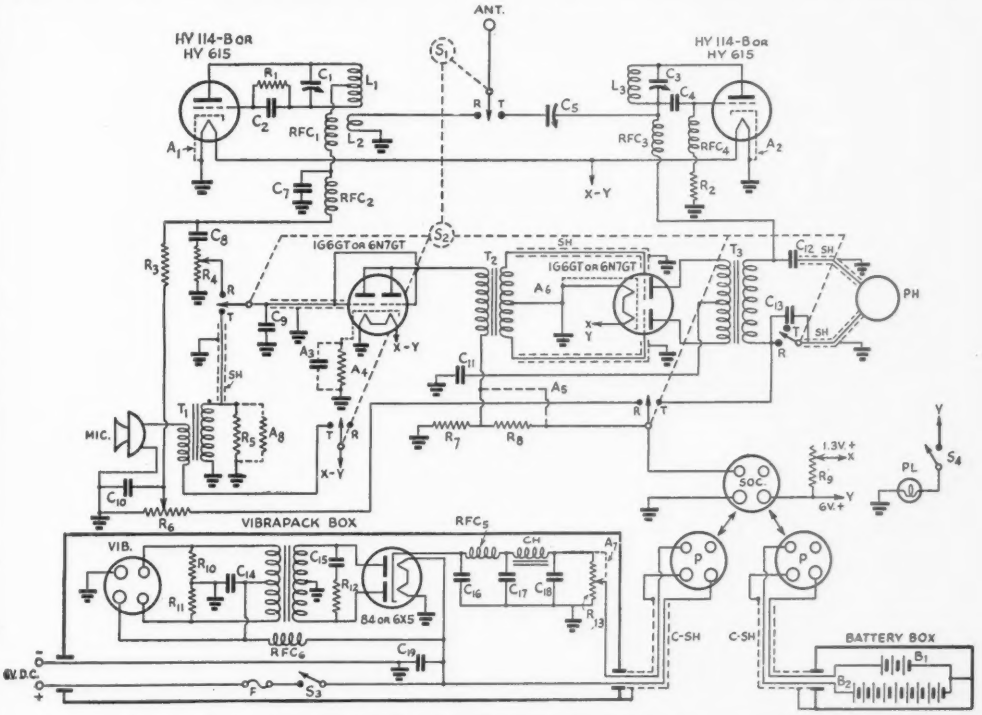



*Fig. 1* — Circuit diagram of the handie-talkie and the associated power-supply unit.

$C_1$ — 8-$\mu\mu$fd. midget variable.
$C_2$ — 50-$\mu\mu$fd. silvered mica.
$C_3$, $C_5$ — 2-30-$\mu\mu$fd. ceramic trimmers.
$C_4$ — 100-$\mu\mu$fd. silvered mica.
$C_6$, $C_7$, $C_8$ — 0.01-$\mu$fd., 400-volt paper.
$C_9$, $C_{13}$ — 100-$\mu\mu$fd. mica. See text on $C_{13}$.
$C_{10}$, $C_{12}$ — 0.02-$\mu$fd., 400-volt paper.
$C_{11}$, $C_{17}$ — 8-$\mu$fd., 450-volt electrolytic.
$C_{14}$ — 5-$\mu$fd., 50-volt electrolytic.
$C_{15}$ — 0.008-$\mu$fd., 1600-volt paper.
$C_{16}$ — 0.05-$\mu$fd., 600-volt paper.
$C_{18}$ — 16-$\mu$fd., 450-volt electrolytic.
$C_{19}$ — 0.5-$\mu$fd., 200-volt paper.
$R_1$ — 5000 ohms, ½ watt.
$R_2$ — 15,000 ohms, 1 watt.
$R_3$ — 25,000 ohms, 1 watt.
$R_4$ — 0.5 megohm, variable.
$R_5$ — 0.25 megohn, 1 watt.
$R_6$ — 250,000 ohms, variable.
$R_7$ — 30,000 ohms, 2 watts.
$R_8$ — 10,000 ohms, 2 watts.
$R_9$ — 10 ohms, 10-watt variable.
$R_{10}$, $R_{11}$ — 100 ohms, 1 watt.
$R_{12}$ — 5000 ohms, 1 watt.
$R_{13}$ — 50,000 ohms, 25-watt variable.
$L_1$ — 4 turns No. 12 tinned wire, ½-inch diameter. Tap 1½ turns from grid end. Spaced to hit band.
$L_2$ — 2 turns No. 18 wire, ½-inch diameter.
$L_3$ — 2 turns ⅛-inch copper tubing, ⅝-inch diameter, spaced 1/16 inch between turns.
$RFC_1$, $RFC_3$, $RFC_4$ — Ohmite Z-1 or Z-0, or 72 turns No. 28 enameled wire close-wound on ¼-inch dowel rod.
$RFC_2$ — 80 mh. r.f. choke.
$RFC_5$ — 10 mh. r.f. choke.
$RFC_6$ — 40 turns No. 14 enameled wire wound in two layers on a ⅜-inch dowel.
CH — 5–25 hy., 100 ma. filter choke.
$S_1$ — Antenna change-over switch. See text.
$S_2$ — 4-p.d.t. rotary wafer switch, mechanically linked to $S_1$. See text.
$S_3$, $S_4$ — S.p.s.t. toggle switch.
$T_1$ — Microphone transformer. 1:2 interstage audio with extra primary winding. See text.
$T_2$ — Stancor A-53-C or equivalent.
$T_3$ — Modulation transformer, 12,000 ohms primary impedance, ratio 1:1. See text.
$T_4$ — Power transformer, 6-volt primary, 375-volt center-tapped secondary. See text.
VIB — Philco 83-0026 or equivalent.
PL — Panel lamp, 6–8-volt.
PH — 3000-ohm headphone.
MIC — Single-button carbon microphone.
SH — Braid tubing shield.
C-SH — Cable shield.
F — 6-volt, 20-ampere fuse.
SOC — 4-prong socket.
P — 4-prong male plug.
ANT — Auto whip or 3/16-inch diameter copper-clad steel tubing, cut to between 42 and 48 inches according to frequency in use.
$B_1$ — Dry "A" battery.
$B_2$ — 180-volt dry battery, 50- to 100-ma. drain.

Dotted lines lettered $A_1$ to $A_8$ indicate necessary changes in cathode connections (which can be permanently installed in either case) and plate leads in order to convert for use with 6.3-volt tubes. The first-audio cathode resistor and by-pass condenser should be 1300 ohms, 1 watt, and 5$\mu$fd., 50 volts, electrolytic, respectively. The microphone-transformer resistor will depend upon the transformer and the plate voltage, a typical value being 50,000 ohms.

modulator. Therefore the added weight of four ounces involved in the use of a small interstage transformer was accepted.

### *Modulation Transformer*

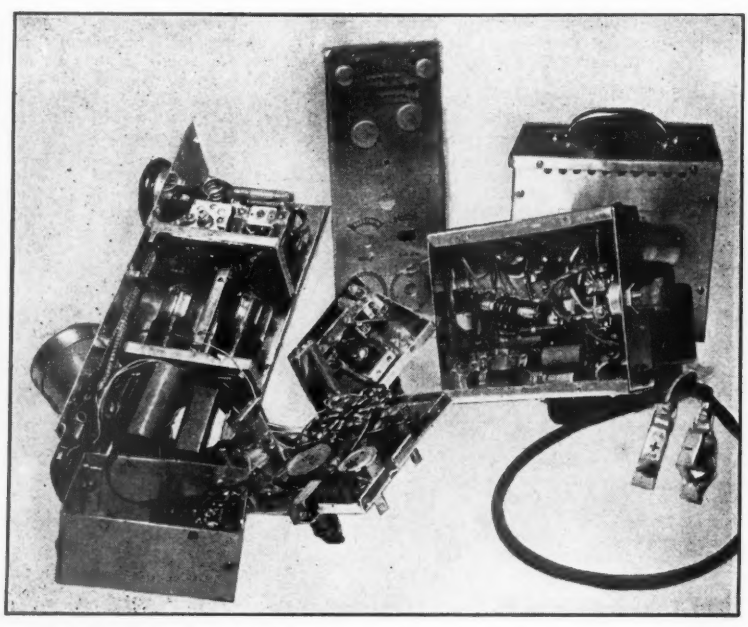
Unless an Inca N-37, Stancor A-3812 or some similar transformer suitable for use as a modulation transformer with the 1G6GT tubes is available, it will be necessary to undertake some interesting construction. We were compelled to do so, since a satisfactory ready-made transformer could not be found in the New York parts stores with which we were familiar. We selected an interstage audio transformer of convenient dimensions and with a known impedance. Since we needed a 1:1 transformer with 12,000 ohms impedance, our calculations were simple. Knowing both the impedance and the turns ratio of our substitute transformer, it was necessary only to count turns as we removed the original windings. The rewinding was done with enameled wire of a size sufficient to carry 15 ma. We used No. 34, which was at hand, although No. 32 or No. 36 would have served. The wire used for the original windings of transformers of this type usually is not large enough to carry the required current.

Rewinding a transformer is not as difficult as one might think. A cardboard form is made in the proper dimensions with respect to core and winding. This is placed on a wooden core which has a headless nail centered in one end. The nail is chucked in a hand drill held upright in a vise, and the wire may be scramble-wound on the form in less than an hour. One can become quite proficient after a little practice, and a nearly layer-like winding can be achieved if a rest is provided for the hand which guides the wire. It will be necessary to dispense with insulation between layers, but not with insulation between primary and secondary. With a little care, a quite workable modulation transformer can be turned out. If operation with increased power is planned, using a 6N7GT in the modulator, a standard output transformer may be used; otherwise a still heavier winding will be required. The small capacity of $C_{13}$ is just sufficient to provide a side-tone signal in the headphones while transmitting.

### *Construction*

The over-all dimensions of the case were first determined by the limitations imposed by the 16-inch transcription disks used as a source of sheet aluminum. A very compact unit was evolved, measuring 3 × 3¾ × 10¾ inches, which houses all components of the four-tube transmitter-receiver except those for the power supply. The weight is 3 pounds, 14½ ounces.

The case is made in two identical L-shaped sections which form a rectangular box when joined together. Each piece has a half-inch lip bent up along the entire length of the shorter side, with holes drilled and tapped for the small machine screws used to fasten the two sections together. In one of these sections is assembled all of the components making up the unit. Since two sides are accessible, the mounting of parts and wiring is facilitated. When the assembly is complete, the ends of the case are closed with two overlapping covers. All exposed aluminum is rubbed down with steel wool to produce a satin finish, and the final touch is given by a coat of clear lacquer or Duco. Lacking steel wool, a similar satin finish may be produced by soaking the aluminum in a strong solution of lye in water.



Handie-talkie and vibrator supply partially disassembled, showing placement of parts under chassis of vibrator pack and behind control and antenna change-over switch panels.

The antenna feed-through insulator is mounted on the top cover, while the power-supply socket, the filament-dropping resistor, $R_9$, and the voltage-divider resistances, $R_7$ and $R_8$, are fastened on the inside of the bottom cover. The method of mounting the microphone and headphone will be clear after an examination of the photographs. The mountings are formed from aluminum and are fastened to the side of the box by means of angle brackets on the inside. The mike and 'phone are held in place by clamps of ½-inch aluminum strip, used in much the same manner as hose clamps. Spacing between the mountings may be de-

determined by measuring the distance between the operator's mouth and ear, or by taking the dimensions of an ordinary telephone handset as a standard.

Looking into the open side of the unit, it may be seen that the case is divided into three main compartments by transverse shields. These add mechanical strength to the assembly and also provide shielding between the compartments. The upper compartment houses the receiver and transmitter tank circuits and the two r.f. tubes, the two circuits being separated by a vertical shield. In the top center is the antenna change-over switch. This is mechanically linked to the shaft of the audio change-over switch, as will be described in detail later. In the middle compartment are mounted the driver and audio-output tubes, with a vertical shield between them. The depth of this compartment is just sufficient to accommodate the tubes and a small sub-panel which serves as a mounting for the controls. In the lower compartment are housed the microphone transformer, driver transformer and modulation transformer, with associated condensers and resistors. Since it was necessary to mount the driver and modulation transformers in close inductive relation to each other, a transverse shield is installed between them. To be effective, this shield should be made of soft iron.

The sub-panel is L-shaped, with flanges bent up along all edges for rigidity. It is fastened to the two sides of the box with machine screws and partially covers the middle and lower compartments. On it are mounted from upper left to lower right, the receiver tuning control, panel light, audio change-over switch, $S_2$, regeneration control, and the panel-light toggle switch. On its back are mounted $R_3$, $R_4$, $R_5$, $C_8$, $C_9$, $C_{10}$ and $C_{13}$. No power switch is provided, its function being performed by the insertion and removal of the power plug.

Trouble may be experienced in buying a 4-pole double-throw change-over switch which will fit into the small amount of space available for the audio section. One to fit can be designed from scratch or adapted from another already at hand. Following the latter course, it proved possible to make a very satisfactory 4-p.d.t. rotary switch on a single wafer of a Yaxley gang switch.

### *Antenna Change-Over Switch*

Details of construction of the antenna change-over switch are shown in Figs. 2 and 3. The switch was designed especially to fit into the available space, to provide the best possible insulation, and to permit driving it from the shaft of the audio change-over switch. This is accomplished by a mechanical link between the two shafts. Collars with angle brackets soldered to them are installed on both shafts. Holes are drilled and tapped equidistant from the center of each bracket to accept the machine screws used to attach the ends of the connecting rod. The latter is made from a strip of ⅛-inch bakelite panel stock, drilled at the ends to fit the fastening screws snugly. The rod is so installed that the turning of the knob on the 4-p.d.t. audio switch will also turn the shaft on the antenna change-over switch. If the two switches require different quadrants of an arc to make contact in each of the two positions, the compensation is made by

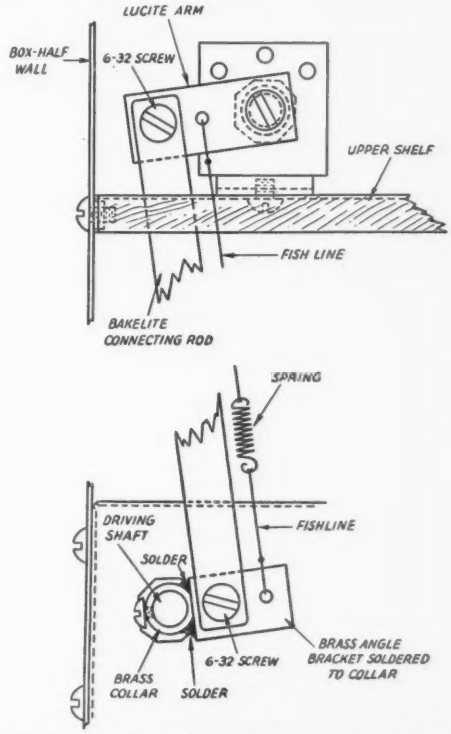



*Fig. 2* — **Details of the connecting-rod drive used between the audio and antenna change-over switches and between the panel shaft and receiver tuning control. No tension spring is required on the antenna switch connecting rod and a collar angle bracket is used on both shafts, instead of the upper Lucite arm shown for the receiver drive. The connecting rod is centered ⅜ inch from the center of the driving shaft and 1⅛ inch from the center of the driven shaft, providing a 3:1 ratio for the receiver drive. The drive ratio on the change-over switch may be varied in accordance with the requirements of any particular assembly by spacing the holes in the angle brackets.**

correctly spacing the holes in one or both angle brackets from the center. In this manner any required ratio of drive, within reasonable limits, can be provided.

Basically, the antenna switch itself is a s.p.d.t. switch, mounted on a 1⅝ × 3⅜-inch panel of ⅛-inch bakelite suspended from an aluminum channel bracket which is attached to the top cover of the box by the antenna feed-through insulator, as well as to the back side of the case, as shown in Fig. 3. The stationary contacts are 6-32 brass machine screws with the heads filed flat to 1/64-inch thickness. They are mounted, complete with solder lugs, on a strip of Lucite ½-inch wide, which is supported ½-inch away from and parallel to the lower edge of the bakelite panel by means of spacers made from ⅜-inch Lucite rod. These spacers also serve as stops for the contact arm. The heads of the

contacts are toward the panel. The shaft is a length of ⅜-inch Lucite rod turned down to ¼-inch diameter except for a ⅜-inch shoulder, just under ½-inch long, on one end. This end is drilled and tapped for a 4-36 machine screw by means of which the spring-brass contact arm, 5/16-inch wide, and solder lug are attached. Lightweight spring brass, such as is found on some weather stripping, will provide sufficient tension for good contact; if the edges are slightly turned up where the arm slides over the fixed contact points, operation will be smooth. It is important to form the bearing surface of the arm so that it will make a flat positive contact with the points.

The bakelite panel supporting the antenna switch also provides a mounting to which the transmitter coupling condenser, $C_5$, and the receiver coupling coil, $L_2$, are attached, and holes are provided in the mounting and case so that adjustments can be made with an insulated screwdriver after the case is closed up.

The receiver tuning control on the sub-panel is coupled to the shaft of the tuning condenser by a link rod similar to that described for the change-over switch. By making the driving arm on the control shaft shorter than the one on the condenser shaft the drive is reduced by a ratio of three to one, so that the band covers about 45 degrees on the tuning-control scale. Backlash is minimized by a small coil-spring tensioner tied between the two driving arms. The stops which are provided automatically when the linking strip contacts the shafts at either end will be found very useful when attempting to tune the receiver in the dark to conserve the power consumed by the pilot lamp when operating from dry batteries.

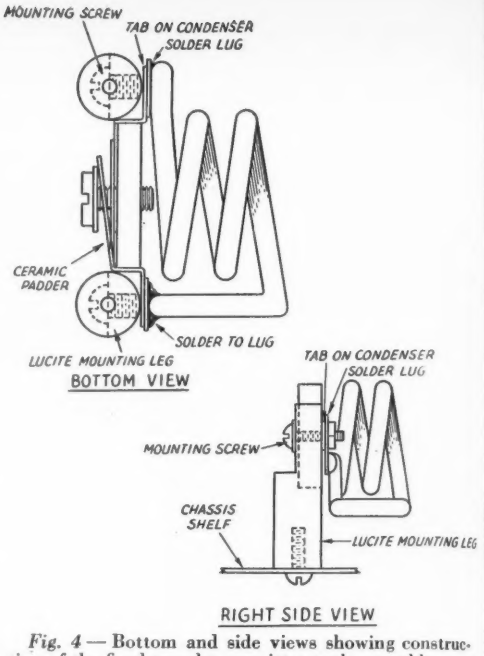



*Fig. 4* — Bottom and side views showing construction of the fixed-tuned transmitter tank assembly.

### *Transmitter Tank*

Fixed tuning of the transmitter tank circuit not only provides the advantages of reduction of variable controls and spot-frequency operation, but it becomes essential under conditions in which even the smallest midget variable condensers are too large for the available space. Fig. 4 shows the tank assembly, consisting of a 30-$\mu\mu$fd. compression-type trimmer and an inductance of two turns of ⅛-inch copper tubing, ⅝-inch inside diameter, with a separation of 3/16 inch, center to center, between turns. The solder-lug terminals of the coil are set to match the spacing of the mounting tabs on the padder. The assembly is then mounted on Lucite spacers, ¾-inch from the compartment shelf. Adjustment to make the tank hit the band is achieved by squeezing or separating the turns of the inductance. Since the condenser holds its setting best if the plates are fairly close together at the operating frequency, it is well to prune the moving plate by snipping a bit at a time from the end or corners of the plate until the desired setting is reached. It is necessary to flatten the plate and smooth its edges after pruning, in order that the mica separator may not be punctured. Little pruning will be required if the dimensions given in the specifications are followed carefully. If it should be necessary to substitute No. 9 or No. 10 wire for the ⅛-inch copper tubing, some "cut-and-try" experimenting will become necessary.

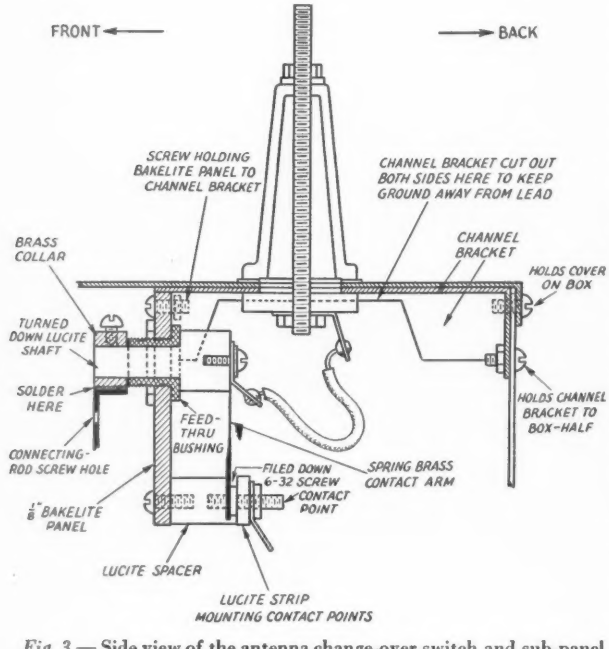



*Fig. 3* — Side view of the antenna change-over switch and sub-panel assembly. The front of the unit is at the left in this drawing.

The remaining half of the box serves as a cover. A Plexiglass strap handle, cut from a discarded pair of suspenders, is mounted upon it. Lettering and pointer-knob scales are drawn with a pen and black "touch-up" Duco, which flows from a pen like ink. It may be found in auto supply stores. Holes are drilled through the sub-panel and outer cover in accurate register to accept the four shafts, the panel light and the toggle switch. These holes are made as small as possible, allowing only for free operation of the moving parts. Felt washers moistened with very light oil are placed between the panel and the knobs to aid in keeping out moisture and dust. Conveniently located holes are also provided in the cover to allow for adjustment of the ceramic trimmers in the antenna-coupling and transmitter-tank circuits and of the receiver pick-up coil. These holes are closed with small snap-in cover buttons. If the equipment is likely to be used in wet weather, the unit case should be sealed by running Duco cement into all seams and waterproof covers of oiled silk or thin rubber provided for the headphone and microphone.

### *Power Supply*

This unit may be operated from compact dry batteries wherever required, if the 1.4-volt tubes are used. A Burgess 2-F will make an excellent filament supply, while two or three Everready Minimax 467s may be combined in a pocket power pack providing 135 or 180 volts for the plates. The dimensions of the battery box will depend upon the batteries used, but the proportions should be such as to enable it to be slipped into a coat pocket or hooked to a belt. A cable is provided which is just long enough to reach from the pocket or belt carrying case to the power socket on the bottom of the unit, when carried in the hand.

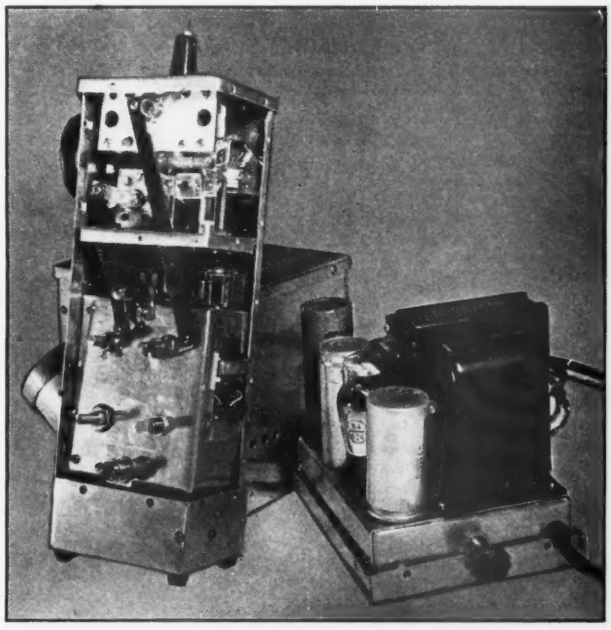
There will be many cases in which the unit can be used within a radius of 25 feet from a car or a portable storage battery, if a small vibrator supply is provided with a 25-foot cable. In our case the vibrapack case was formed of the transcription-disk aluminum to dimensions of $5\frac{1}{4} \times 6\frac{3}{4} \times 6\frac{1}{4}$ inches. If a motorcycle-type storage battery is available, it can be included in the case if the dimensions are made larger. The box was built like the main-unit box and was provided with an aluminum chassis, $1\frac{1}{2}$ inches deep and of over-all dimensions just right to slip into the box. The power transformer is a rewound job with a center-tapped, 6.3-volt primary replacing one of the original filament windings. An 84 rectifier tube was used, although a 6X5 would perhaps have been a better choice. These, with the filter choke, filter condensers and vibrator are mounted on top of the chassis, while other components are mounted below. The battery cable is a 2-wire shielded microphone cable, the shielding being used for the connection to the grounded side of the battery. While Fig. 1 shows the negative side of the battery grounded, some car batteries have the positive terminal connected to the chassis. When this is the case, the polarity shown will be reversed, of course. If mike cable is unobtainable, many auto-supply and electrical stores may still have twisted-pair covered with flexible-braid shielding. If not, three lengths of rubber-covered lamp cord may be lashed together to serve as a cable.

In order to obtain the required voltage at the taps, it will probably be necessary to experiment with the values of the voltage-divider resistors, $R_7$ and $R_8$. The values given are close, but only approximate. A 50,000-ohm slider resistor would serve better. It may also be necessary to experiment with the value of the buffer condenser, $C_{15}$, since its value will depend upon the characteristics of the transformer used.

The filament-voltage dropping resistor, $R_9$, is so adjusted that with a 6.3-volt source the voltage across the filaments at the far end of the cable will measure 1.3. This will allow some leeway for a rise in filament voltage if the storage battery is across a charging generator. Thus the life of the filaments may be conserved. If trouble from vibrator noise is experienced, it may help to use a separate $4\frac{1}{2}$-volt battery for the microphone.

### *Antenna*

The antenna is a sawed-off auto whip antenna supplied with a tapped bushing at the bottom end to fit the screw in the feed-through insulator. When not in use it is telescoped and fastened to



**The handie-talkie and power units assembled except for the covers, showing mounting of sub-panels and assembly of connecting rods.**

the side of the case by means of clips taken from a cartridge-fuse block. For a half-wave antenna, which is recommended for this type of operation, the whip should be extended to 48 inches. After determining the exact length for the frequency to be used, the point of extension should be marked with a file so that the setting can be correctly made even in the dark. It should be remembered that WERS work must frequently be done in the dark, therefore touch adjustments should be provided wherever possible.

In actual performance this unit has met all expectations. In a completely built-up suburban section of New York City, when operating at the same time and on the same frequency with thirty other stations in the county, reliable and consistent contacts have been made over a distance of more than three miles, with S7 to S9 reports. No attempts have been made to try for DX, since that is not the purpose of WERS operation; therefore the maximum range possible probably will remain unknown until after the war. One thing that is known is that the unit does its job in a workmanlike manner and fills a definite need for handie-talkie operation.

### *Cost*

Possibly the reader's imagination may have been staggered by the cost limit mentioned in the title, but it should be explained that the bulk of this sum arises from certain questionable items listed under the categories of man-hour costs, emergency costs and public-relations costs in our own final balance sheet:

BALANCE SHEET

| | | |
|---|---|---|
| *Unavoidable Parts Costs:* | | |
| 2 HY114-B tubes, @ $2.25 | $ 4.50 | |
| 2 1G6G tubes, @ $1.35 | 2.70 | |
| 1 84 tube | .90 | |
| 1 modulation transformer | .98 | |
| 1 auto whip antenna | 1.25 | |
| 1 5–25 hy. power-supply choke | .98 | |
| 5 sockets, @ $.15 | .75 | |
| 1 toggle switch | .30 | |
| 4 pointer knobs, @ $.20 | .80 | |
| 1 voltage-divider resistor | .72 | |
| 1 8-μfd. electrolytic condenser | .60 | |
| 1 250,000-ohm regeneration control | .60 | |
| Assorted resistors (estimated) | 1.00 | |
| Assorted condensers (estimated) | 2.00 | |
| Assorted screws and hardware (estimated) | 1.50 | $ 19.58 |
| Sales tax | $ .19 | .19 |
| *Estimated Additional Parts Costs:* | | |
| Salvage value of other parts used (no actual expenditure because such parts already on hand) | $ .30 | |
| Appreciation of such parts after salvage | .30 | .60 |
| *Public Relations Costs:* | | |
| Eight scotch-and-sodas for source of aluminum * | $ 4.00 | |
| Carfare to get there | .10 | |
| Rental of Seeing-Eye dog to get back again * | 2.00 | |
| Carfare to source of "discarded" mike cable | $ .20 | |
| do., to source of "past-dated" batteries | .20 | |
| do., to source of "discarded" s.b. mikes | .20 | |
| Postage for letter requesting priority on HY114-Bs | .03 | |
| Entertainment for XYL (price of release from doghouse after procurement of aluminum) | 10.00 | |
| Luxury tax on items marked with asterisk (*) | $ .60 | $ 17.33 |
| *Man-Hour Costs:* | | |
| Construction: 40 hours at $50.00 per hour for skilled worker without union card | $2000.00 | |
| Less 10 hours charged against Pleasure and accounted for by items under Public Relations | 500.00 | 1500.00 |
| *Emergency Costs:* | | |
| Iodine for cuts received while working aluminum | $ .15 | |
| Bandage | .10 | |
| Adhesive plasters (they were out of small size) | .25 | |
| Butter (for burns from soldering iron) | .57 | 1.07 |
| Total cost | | $1538.77 |

Of course, it is undoubtedly true that some of these charges may vary in individual cases. The actual cost will depend upon how much of the required material you have on hand and how much you will have to purchase. Probably you will be able to eliminate many of the costs I had to assume — and perhaps you can even eliminate some of the major categories. As a matter of fact, from an entirely practical standpoint it wouldn't surprise me at all if you could build the entire rig at a cost not exceeding $25.00.

## Strays

Listeners to the BBC home and overseas news services were recently thrilled to hear records made in a bomber during an RAF raid over Berlin. The commentator was Vaughan Thomas and the recording engineer Reg Pidsley, G6PI, of Potters Bar, Herts., and a well-known member. A standard set of BBC mobile disc recording equipment was installed in the plane especially for the trip. This gear made it possible to record from any one or from a mixture of three channels: the "intercomm," the commentator, or "effects." G6PI had an exciting few moments over the target when the dropping of a 4000-pound bomb tore a large piece out of the disc. . . . The success of the recordings is a magnificent tribute to the skill and efficiency of the crew. — *RSGB Bulletin.*

—···—

As one Indian ham said upon meeting another: "Long time no see Q!" — *W1IAR.*

# U.S.A. CALLING!

### OPPORTUNITIES REMAIN

IT WAS foreseeable that, when the war reached the advanced training and operational phases, the calls of the armed forces for communications officers would practically disappear. They have indeed. The Signal Corps is at present full up on radio men. The only opportunities we now know of for commissions in the armed forces are in the Navy and Marine Corps, where commissions await a few good men who hold college degrees in physics or electrical engineering. Particulars can be had by writing George W. Bailey, president of the League, at Washington.

In civilian status, the need for radio men of all descriptions remains keen. We call attention to our item of last month on behalf of the Office of War Information, seeking radio operators, technicians and engineers for assignments overseas at excellent salaries. CAA continues in need of radio electricians to install and maintain the very interesting apparatus which is to be found along our airways. There was also an item on this last month. The Civil Service also continues the quest for radio operators and technicians on behalf of many governmental agencies: FBI, Bureau of Standards, and so on. If you will inquire for the Civil Service secretary at your local Post Office, you will be shown particulars on the many announcements of needs that recently have been made.

It is also in civilian capacity that top-notch physicists and research engineers are still being sought for confidential work of great importance. The war isn't won and the development work isn't finished. Trained men with good minds are needed to take hold of these projects, and help is especially needed from those qualified to take charge of such activities and direct the work of others. It is felt that this work may offer many a qualified man a better opportunity to devote his talent to his country's aid than he is now enjoying. Confidential correspondence, looking to mutual exploration of a possible interesting connection, may be entered upon by addressing George W. Bailey, c/o Office of Scientific Research & Development, 1530 P Street, N. W., Washington 25, D. C.

### WACS FOR A.A.C.S.

IN THIS issue we have a special article on the Army Airways Communications System, which we hope you have enjoyed reading. Because of their special needs for highly skilled operators and technicians, you can see that they have a personnel problem. As a partial solution for this problem, the AACS now has a program under way looking toward the use of WAC personnel in its stations, particularly in continental U.S.A.

Ultimately it is planned to have these stations manned by as high as 50 per cent WAC personnel. At present, skeleton crews are being initiated by "in-service" training at various stations, while others are undergoing specialized AACS training at regional schools. This program officially got under way on October 6th, although some WACs had previously served on a detached-service basis.

As a result, the AACS is now looking for Air WACs with radio training and background, whether now in the service or preparing to join. Volunteers are urged to request specific assignment to radio work in the AAF. They may request direct assignment to AACS, although at the moment of writing the machinery for guaranteeing such assignment does not exist. Prospective Air WACs should contact their local recruiting office for information. (Members of the Corps may elect to serve with the Air Forces, Service Forces or Ground Forces.)

Incidentally, the AACS is also interested in WACs already in the service who have received radio training but who have not been assigned to radio work. There are quite a number who were trained in radio under the original WAC company system at Signal Corps training centers, and it is believed that a lot of these girls would be much happier if they could get into AACS, where there is real radio work to be done. We suggest that such WACs investigate the possibilities of transfer to AACS. We may have more dope at ARRL Headquarters.

As far as general qualifications are concerned, previous code training is considered desirable but not entirely essential. In particular, high code proficiency is not required; AACS will take girls who can receive at any speed from two to twenty-five words per minute or more and give them the necessary additional training required to bring them up to standard. Typing ability is especially desirable, of course. Incidentally, we understand that a 30-w.p.m. code speed qualifies a girl for a sergeant's rating, the same as it does a male operator, with other grades in proportion.

Among the specialized jobs performed by WACs in AACS are those of radio operator and mechanic (maintenance), cryptographer, teletype operator, clerk and, possibly the most fascinating of all, control tower operator.

## Strays

The Signal Corps will spend *five billion* dollars this year on the purchase of communications equipment, most of it for radio gear.

# A Directive Antenna for the Low Frequencies

## *Pattern Control by Means of Phase Shifting*

BY B. PENNERS,* W7HLV

**For some years past, broadcast engineers have been controlling antenna-radiation patterns by adjusting the phasing between currents flowing in spaced antennas. W7HLV discusses the principles involved and shows how they may be applied to a simple antenna system for the amateur low-frequency bands.**

FOR some time the need for a practicable type of directional antenna for use on the low-frequency bands has been recognized. The two-fold advantages of antennas of this type have been well established: first, there is the increase in signal strength in the desired direction; and secondly, there is the attenuation of the signal in the undesired direction. There are several types of antennas which fulfill the above description. To a certain extent the common half-wave horizontal antenna is directional, and it is usually erected so that the chief radiation is in some preferred direction, providing there is a choice in the matter of antenna installation. Then there are the long-wire harmonic antennas — the "V," the rhombic and others of the more highly directive but stationary types — all giving appreciable gain in the favored direction and attenuation in others.

However, the trouble always seems to be that the so-called "desired direction" of radiation may vary from time to time, so that the direction of maximum radiation does not always coincide with that choice bit of DX. On the other hand, mechanical problems limit the use of rotatable antennas to the 14-Mc. and higher bands. Even at 14 Mc. the cost of a proper supporting structure may be considered to outweigh other advantages in many cases. The purpose of this article is to present a method whereby the pattern of a fixed end-fire type of array which can be erected on a 50 × 100 foot lot may be rotated, in contrast to the usual amateur practice of rotating the antenna itself. By this method trees or other available supports, which would not be suitable for the rotatable type, may be put to use.

A great many broadcast stations throughout the world now use vertical arrays to produce a radiation pattern which will favor certain areas and, at the same time, protect the service areas of other stations operating close to the same frequency by attenuating the signal in other directions. The resulting pattern of any such array depends upon several factors, such as the spacing between elements, the difference in phase of excitation of the elements, and the ratio of currents flowing in them. By using two or more vertical antennas and varying the phase of the currents feeding them, almost any pattern can be obtained.

While the gain of such an array increases as elements are added, the greater feeding complications, as well as space requirements, will limit most amateur applications to the three-element arrangement, which will be discussed in detail. With such a simple array it is posible to obtain gains over the usual dipole of 5 to 6 db. in the most favored directions.

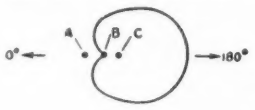



*Fig. 1* — Field pattern from an end-fire system with 90-degree element spacing and 90-degree phase difference.

### *Horizontal Pattern*

The shape of the horizontal pattern of this array is a function of

$$2 + 2 \cos (A + S \cos \theta)$$

where $A$ is the phase relationship in degrees between the end antennas and the center antenna, being considered positive in respect to one end antenna, while negative in respect to the other. $S$ is the spacing between elements in degrees, and $\theta$ is the angle of direction in question in respect to a line drawn from the center antenna through the one with leading current.

Now, as may be seen from the above expression, maximum gain will be obtained when $(A + S \cos \theta)$ is equal to unity, since the cosine of any angle cannot exceed 1. Also, cos $(A + S \cos \theta)$ can equal unity only when $(A + \mathrm{S} \cos \theta)$ is equal to zero, since 1 is the cosine of 0 degrees. To illustrate this, it is necessary to assume a spacing and desired direction of maximum radiation. If we have a spacing of a quarter wavelength, or 90 degrees, and choose a bearing of 180 degrees as the desired direction for maximum radiation,

$S = 90 \qquad \theta = 180$
$A + S \cos \theta = 0$
$\cos 180 = -1$
$A + 90 \cos 180 = A + [(90)\ (-1)] = 0$
$A - 90 = 0$
$A = 90$ degrees

Therefore, to obtain maximum radiation at 180 degrees, the phase difference between adjacent elements must be 90 degrees.

Points for plotting the shape of the pattern on polar graph paper may now be determined by working out the formula with different values

*Chief Engineer KID, KNFB, 757 E. 13th St., Idaho Falls, Idaho.

assigned to $\theta$, keeping $A$ and $S$ constant at 90 degrees each. The tabulation is as follows:

| $\theta$ | $\cos\theta$ | $S\cos\theta$ | $A + S\cos\theta$ | *Relative strength* |
|---|---|---|---|---|
| 0 | 1 | 90 | 180 | 0. |
| 30 | 0.866 | 78 | 168 | 0.044 |
| 60 | 0.5 | 45 | 135 | 0.586 |
| 90 | 0. | 0 | 90 | 2.0 |
| 120 | −0.866 | −45 | 45 | 3.414 |
| 150 | −0.5 | −78 | 12 | 3.956 |
| 180 | −1 | −90 | 0 | 4.0 |

The resulting pattern shape when these points are plotted is shown in Fig. 1.

To reverse the pattern it is necessary only to provide some means whereby the feed lines to the end antennas can be switched, so that the antenna with the lagging current will now have the leading current.

The next problem is to rotate the pattern so that maximum radiation will be broadside to the array; i.e., at an angle of 90 degrees in respect to the plane of the antennas. $S$ will remain at 90 degrees as before, and $\theta$ will become 90 degrees as the angle at which maximum radiation takes place. As before, cos $(A + S\cos\theta)$ must be set equal to unity. Substituting the new value for $\theta$,

$$\cos(A + 90\cos 90) = 1$$

Since cos 90 is 0, cos $A = 1$ and $A = 0$ degrees.

Tabulating for different values of $\theta$,

| $\theta$ | $\cos\theta$ | $S\cos\theta$ | $A + S\cos\theta$ | *Relative strength* |
|---|---|---|---|---|
| 0 | 1 | 90 | 90 | 0. |
| 30 | 0.866 | 78 | 78 | 2.416 |
| 60 | 0.5 | 45 | 45 | 3.414 |
| 90 | 0. | 0 | 0 | 4. |
| 120 | −0.5 | −45 | −45 | 3.414 |
| 150 | −0.866 | −78 | −78 | 2.416 |
| 180 | −1. | −90 | −90 | 0. |

The resulting pattern plotted on polar graph paper then looks like Fig. 2.

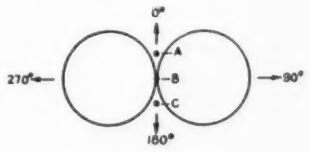



*Fig. 2* — **Field pattern obtained when the end-fire elements are excited in phase.**

### *Phase Adjustment*

The next step is that of adjusting the phase of the antennas so that the desired pattern is obtained. Any transmission line introduces a constant phase shift along its length. Therefore, if the feed lines to the antennas are made of different lengths, the required phase difference can be introduced by the lines themselves. If all three lines are made equal in length all will introduce the same amount of phase shift between input and output ends, and thus the starting phase relationships will be retained at the output ends. If the lines are of unequal length it will be necessary to determine the phase relationship between each end antenna and the center element, and to make suitable corrections so that no unwanted phase shift will occur. To determine the phase shift caused by the transmission line, a point equidistant from the center antenna and one end antenna should be chosen as the checking position and a field-strength meter placed there. This


*Fig. 3* — **Triangle construction for determining phase difference from field-strength measurements.**

point need be only about a half wavelength away from the antennas. The line feeding the end element should be terminated in a resistance equal to the surge impedance of the transmission line; it may then be disregarded for the time being. Both the center antenna and the remaining end antenna should be energized and the current to each adjusted to the same value. The reading of the field-strength meter should then be recorded.

The line to the end antenna should next be terminated with a resistance equal to the surge impedance of the line feeding it and the input to the center antenna adjusted to give the same antenna current. The new field-strength reading should be recorded.

Next the line feeding the center antenna should be terminated in a resistance and the input to the end antenna adjusted to restore the original current. The reading of the field-strength meter again must be recorded.

The three field-strength readings may then be converted into some convenient units of linear measure, such as inches or centimeters, and these values used to construct a triangle, as shown in Fig. 3. The length of the base of the triangle is proportional to the field-strength reading taken when both antennas were excited. The lengths of the other two sides are proportional to the field-strength readings obtained when each antenna was excited separately. The phase difference is then equal to 180 — $\phi$. The angle, $\phi$, can be found by the use of a protractor or by means of trigonometric calculations.

If the antennas are 180 degrees out of phase the field strength at the recording point will be zero when both antennas are radiating, since the fields are equal in amplitude but opposite in phase and therefore cancel. If the antennas were in phase the fields would be equal in amplitude and in phase, and so the field strength would be doubled. In the first case the triangle would have no base and the phase difference would be 180 − 0 = 180 degrees. In the second instance the base would be twice the length of either side, and thus $\phi$ would be 180 degrees and the phase difference 180 − 180 = 0 degrees. The phase relationship of each end antenna in respect to the center antenna must be determined separately and corrections made by lengthening or shortening the transmission lines, whichever is needed to bring the antennas into the desired phase relationship.

In practice, it will usually be best to adjust the lines so that all antennas are in phase (zero phase difference). This will give a pattern of the type shown in Fig. 2, with maximum radiation at right angles to the plane of the antennas. Then the unidirectional patterns of Fig. 1 with maximum ra-

diation in line with the antennas may be obtained by inserting suitable networks of the types shown in Fig. 4. Such networks can be designed to give any desired degree of phase shift. The inductive type shown in Fig. 4-A will produce a shift in the positive direction, while the capacitive type of Fig. 4-B will cause a negative phase shift.

The proper reactances for any required degree of phase shift may be determined as follows:

*Positive phase shift:*

$$X_L = Z_o \tan \frac{\theta}{2}$$

$$X_C = \frac{-Z_o}{\sin \theta}$$

*Negative phase shift:*

$$X_C = \frac{Z_o}{2} \tan \frac{\theta}{2}$$

$$X_L = \frac{-Z_o}{\sin \theta}$$

In these equations, $Z_o$ is the characteristic impedance of the transmission line in ohms and $\theta$ the desired phase shift in degrees. The reactances are also in ohms.

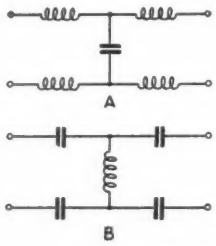



*Fig. 4* — Phase-shifting networks. A — For positive phase shifts. B — For negative phase shifts.

As an example, let us assume that 600 ohms is the characteristic impedance of the transmission line. Then, for a positive phase shift of 90 degrees,

$$X_L = \frac{600}{2} \tan \frac{90}{2} = 300 \tan 45 = 300 \text{ ohms}$$

$$X_C = \frac{-600}{\sin 90} = 600 \text{ ohms}$$

For a negative phase shift of 90 degrees,

$$X_C = \frac{600}{2} \tan \frac{90}{2} = 300 \text{ ohms}$$

$$X_L = \frac{600}{\sin 90} = 600 \text{ ohms}$$

The corresponding values of inductance and capacity may be calculated from the conventional formulas for $X_L$ and $X_C$:

$$L = \frac{X_L}{2\pi f} \qquad C = \frac{1}{2\pi f X_C}$$

One method of coupling to the three transmission lines is shown in Fig. 5. By using a suitable switching system the transmission lines to the end antennas may be interchanged, reversing the pattern. To obtain the pattern of Fig. 2, the networks should be switched out.

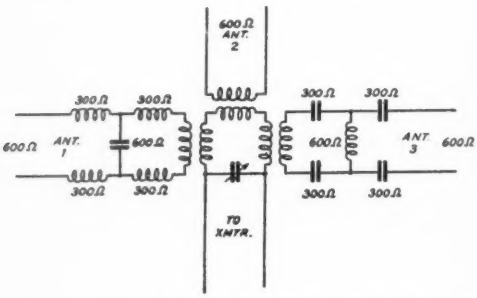



*Fig. 5* — Suggested coupling system for feeding three antenna elements with 90-degree phase difference.

*Fig. 6* — Suggested arrangement of a 3-element array.

The erection of a suitable antenna is left to the individual. One simple method would be to suspend the three elements from a single wire, as suggested in Fig. 6.

## Missing in Action

W6SJL, S/Sgt. Clifford D. Garrabrant, USMC, of Whittier, Calif., a Marine Corps dive-bomber pilot, has been reported missing in action in the Solomons area.

## Prisoners of War

W4CSE, Ralph J. Gregory, of Nashville, Tenn., although technically not a prisoner of war, has been interned in Turkey following the crash landing of a B-24 in which he was radioman-gunner.

## Silent Keys

IT IS with deep regret that we record the passing of these amateurs:

Ex-W1BXS–ex-W1FT, John W. Marren, Rumford, R. I.
Ex-W1FD, James L. Hubbard, Norwich, Conn.
W1GVF, Samuel Curtis, jr., Boston, Mass.
W6CWJ, Harold F. Emmal, San Francisco, Calif.
W8EBP, Hubert M. Hathaway, Utica, N. Y.
W8MFE, Dr. Raymond C. Turner, Oswego, N. Y.
W8POQ, Ralph K. Rex, Cleveland, Ohio
W9FFZ, Hugh S. Glassburn, Rantoul, Ill.
VE4ARR, Flight Lt. George Low, Norway House, Man., Canada
G4AS, Major John Holding, RCS, West Kirby, Cheshire, England
G8IX, Flight Sgt. R. J. Rider, RAF, Old Woking, Surrey, England
EI9M, Desmond Ingram, Dublin, Eire

# ON THE VERY HIGHS

CONDUCTED BY E. P. TILTON,* W1HDQ

It was all very impromptu. Brannin, W6OVK, and your conductor were over in the engineering department looking over some new gear now just getting ready for production. Showing us its gadgets were Ling, W1IBF, and Johnson, W6OE. Hanging around the edges were Schall, W1JLI, and Shaw, W1IN. Six former v.h.f. enthusiasts — a small part of a much larger group working, now, on much higher frequencies then they ever dreamed of in the happy days prior to December 7, 1941. This looked like a good time to start the ball rolling for that 56-Mc. dinner Jim and I had been talking about. Followed a couple of hours of telephoning various prospects, leaving word to pass the news around that there would be a gathering the following day for dinner and an evening of "shooting the breeze."

We knew many we'd like to have seen, but inquiry as to their whereabouts turned up the fact that the gang was pretty well spread around. However, although many of the calls brought no result, the following evening fifteen v.h.f. men from 'way back turned up, including W1AYG, W1ALP, W1BYY, W1DA, W1EKT, W1HDQ, W1HA, W1IBF, W1IHA, W1IN, W1JMY, W1KTX, W1LZV, W6OVK and W6OE.

It had been quite a while since we'd had a chance to do much hamming; we didn't realize how long until we discovered that names and calls, facts and figures, which used to be on the tips of our tongues had somehow receded into the background of memory. It took a while to get warmed up, but once started the session could have been going yet. Every one of the group is now engrossed in work wherein we count our megacycles in the thousands; yet it was not of our current problems that we talked that evening, but rather of the high spots of a happy decade of work on 56 and 112 Mc. which ended with the outbreak of war.

Large-scale hamfests may not be practicable in these times; but if our experience that evening is any criterion, small gatherings can (and should) be planned for groups of hams having a common interest. Despite the impromptu nature of the affair, every man present agreed that it was the most pleasant evening he'd had in months.

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Some time back we gave publicity to a report that a Detroit WERS station had been heard on the East Coast, in the hope that more details might be forthcoming. Arthur Lyman, W8SPJ, Radio Aide for the City of Detroit, now tells us that he received a call from a government station at Garden City, L. I., reporting reception of WKAU-1, working WKAU-9; but, unfortunately, the details of the reception at Garden City are not sufficiently accurate to provide a complete check with the log of Detroit's control station WKAU-1. However, if any WERS station has a chance of being heard at distant points it should be this one, for Lyman reports that their coaxial antenna is 558 feet high!

—···—

W6OVK is spending most of his time traveling around the country these days. Whenever he lights in any one place for more than a few minutes, he manages to look up a few former five-meter men. On a recent trip to the West Coast he promoted another of those impromptu hamfests, this time for a luncheon which was attended by W8QDU and W6s DNS, OIN, EJN and OVK. Needless to say, they had Five Meters for lunch! Jim also saw Bill Adams, W6ANN, and he reports that Bill, with a prize location already, is eyeing a spot even higher and waiting only for the completion of a new road before buying a plot of ground and erecting a home for his postwar v.h.f. activities. On the way across the country a stop at Dallas turned up the fact that W5AJG is still there, but feeling very low at times, especially when the f.m. and police bands break loose with juicy sporadic-*E* skip!

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Sometimes our news of the whereabouts of various members of the v.h.f. fraternity is a little bit cold by the time it reaches some of the customers. Having seen in the pages of a not-too-fresh copy of *QST* that W4GJO was in England, Ensign Gene Sykes, USMS (c/o Postmaster, New York City), spent a week or so in G-Land searching for Grid, only to find, upon returning to New York and catching up on four months of *QST*, that Grid had been brought back to this country!

While at home in West Palm Beach, Fla., Gene was visited by Pvt. Preston Schuler, W3BYF, now stationed at Camp Murphy nearby. Returning to New York, Gene ran into Ab Adams, Sea2c, USCG, W4FNR, on leave from Groton. The main project of the day was to get to the top of the Empire State Building and yearn for a similar QTH!

A tip from Gene: "You might pass on to the boys that the empty shell casings from three-, four-, and five-inch anti-sub guns make FB lines for 2½-meter rigs, especially the so-called 4/38. It has an inner diameter just a hair over four inches and is made of medium-heavy brass, all one piece and beautifully machined. Of course, you have to be light-fingered or 'in solid' to get them by the CO, but that should be a minor detail to most hams!"

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Knowing that the organization of which we are now a part is composed largely of hams, we

(*Continued on page 92*)

*329 Central St., Springfield, Mass.

# ★ BOOK REVIEWS ★

**Mathematics Essential to Electricity and Radio,** by Nelson M. Cooke and Joseph B. Orleans. Published by McGraw-Hill Book Co., New York. 418 pages, 6 × 9. 1943. Price, $3.00.

According to the preface by the authors, this book is intended to adapt Lt. Cooke's book on "Mathematics for Electricians and Radiomen" to secondary-school level and to high-school teaching techniques. This it does in a most satisfactory manner.

The new book takes much of its material from the original volume, omitting that which was thought to be beyond the ability of the students for whom it was intended. The same clarity and conciseness appears in the new book. Its clarity and its mathematical continuity is such that it should be a very satisfactory text for those for whom self-study is necessary. While the theme is essentially mathematical, it has the story of electricity and radio woven into it in such a manner that the math takes on a concrete meaning and is therefore more absorbing than straight algebra, geometry or trigonometry. The arrangement makes it possible to omit any part in which the student is already qualified.

Beginning chapters cover the development of our mathematical systems and the manipulation of the fundamental operations, followed by a chapter on these operations using the volt, ampere, ohm, etc., as units. This makes for an easy transition into Ohm's Law and other d.c. relationships.

It is interesting to observe how the authors switch back and forth from math to electricity. Chapters on factoring, fractions and equations containing fractions are followed by a chapter on Ohm's Law and parallel circuits. Then come graphs, with generators, motors and batteries in their wake. Exponents and radicals, together with quadratic equations, form a suitable introduction to Kirchkoff's Laws. Logarithms are tied up with decibels and transmission lines. A chapter on angles leads easily into trigonometric functions, involving the solution of right triangles. All this furnishes the foundation for a discussion of periodic functions, bringing in the sine, cosine and tangent curves — so important in any study of a.c. Vectors, rectangular and polar forms, the *j* operator and other mathematical devices are intermingled with phase, frequency, periodicity and average values of a.c.

The book concludes with two chapters on alternating currents — one on series and the other on parallel circuits. Throughout the volume are many examples and problems. Answers to the problems are found at the end of the book.

In these days when secondary schools are going in for radio and electricity in a more substantial manner than in former years, this treatise should prove helpful in putting life into mathematics — something long needed.

**Fundamental Radio Experiments,** by Robert C. Higgy. Published by John Wiley and Sons, New York, 95 pages, 5½ × 8½. September, 1943. Price, $1.50.

When the war broke out, the necessity for training large numbers of radio men became very evident. The U. S. Office of Education undertook the task of setting up courses to fill this deficiency. Suitable courses were agreed upon and the colleges and universities were brought in to do the work. Soon, however, it became noticeable that there was a shortage of modern texts, especially texts dealing with experimental phases of radio. Mr. Higgy has produced such a text — a little late, perhaps, for the original job, but nevertheless something which may be a foundation-stone for the future.

This little volume covers 32 experiments dealing with the fundamental d.c. and a.c. relationships as well as vacuum tubes and circuits. The diversified subjects covered include inductance, capacity, resonance at high and low frequencies, bridges, thermionic omission, diode, triode and pentode tubes, power supplies, resistance-coupled amplifiers, various other types of amplifiers, r.f. oscillators, sweep circuits, telephone circuits, public-address systems, modulation, detection, frequency measurement and transmission lines.

The book seems to be intended for use in regular classroom work under an instructor, for the explanations of experimental procedure are not given in too much detail. Some theory is given in connection with each experiment, but few suggestions are outlined as to the conclusions to be drawn from the experiment.

We have the feeling that this book might profitably be increased in scope, covering additional subjects, and that it should contain additional detail so that the services of an instructor would not be so indispensable.

**Practical Radio Communication** (Revised Second Edition), by Arthur R. Nilson and J. L. Hornung. Published by McGraw-Hill Book Co., New York. 927 pages, 6 × 9, with many illustrations, diagrams and charts. January, 1943. Price, $6.00.

"Practical Radio Communication" has long ornamented the book-shelf of many a present or prospective operator, for it contains in one lump details of all branches of civilian operating. The present revised edition contains much new material made necessary by advances in the radio art.

The book starts out with chapters on d.c., a.c. and the fundamentals of vacuum tubes, taken up in sufficient detail to be used as a text by new students or for review by practising operators. From here the book goes into the main business of radio communications — transmitters and receivers. To the discussion of the older principles and circuits has been added material on the very-high and ultrahigh frequencies. Military applications are not included. In the transmitter section, methods of lining up the transmitter, operating adjustments and coupling to the antenna are fully explained. Considerable space is devoted to a discussion of apparatus and circuits for use in the u.h.f. region. In the receiver section, regenerative, superregenerative and superheterodyne types are considered. Uses of the oscilloscope in a radio station are explained. Test equipment and methods for using it are covered sufficiently so that an operator out of touch with his base should be able to get an answer which will enable him to carry on. In the chapter on antennas and wave propagation the authors go into the theory of the subject and point out where and how waves depart from their usual courses. Various types of directional antennas, antenna patterns and special antennas are dealt with rather fully.

Aviation radio communication receives very complete treatment. This chapter includes discussions of radio markers, beacons, directional antennas, direction-finders and other navigational safety devices. Nor is the broadcast operator overlooked. He gets material on acoustics, treatment of studios and placement of pick-up equipment, and instruction on sound and its effect on the human ear. Various types of microphones, transcription apparatus and expansion systems are well covered. Control, mixing, amplifier, equalizer and switching equipment receives much attention. Several types of a.m. broadcast transmitters are pictured, diagrammed and explained. Hints on maintenance, tuning, monitoring and antennas complete this section.

Frequency modulation is the subject of a separate new chapter. The general theory of f.m. transmission and reception is explained and circuits and descriptions of commercial equipment are given. A portion of the chapter is devoted to the design of antennas.

A-1 and A-2 emission come to the fore in the chapters on marine radio transmitters. Diagrams, pictures, parts lists and possible causes of trouble are given. Emergency equipment, life-boat transmitters, harbor radio, ship-to-shore and general marine radiotelephone are taken up for the benefit of the sea-going brethren. Ship-board antennas necessarily receive attention. Receivers peculiar to marine use and combination send-receive telephone sets are covered. Automatic radio alarms used in receiving distress signals are explained with the aid of many pictures and diagrams. The procedure to be followed when an alarm is received and an explanation of log entries and other federal requirements add to the value of this chapter. The marine section is concluded with a chapter on direction finders and navigational aids. This includes calibration and operation of the equipment as well as methods for its use.

In the index department we could wish for a lot more detail. The book contains over 900 pages, of which only 12 are devoted to the index. Many important items are neatly tucked away in the text in such a manner that they cannot readily be found.

— *T.A.G.*

# A Simplified Tape Code-Practice Oscillator

## *A Combination Circuit Requiring No Relays*

BY FORREST A. BARTLETT,* W6OWP, AND ARTHUR F. BURNS*

**Considerable interest has been shown in the homemade keyer using standard Wheatstone perforated tape which was described in the November, 1942, issue of *QST*. For code-practice purposes, the authors show how the audio oscillator may be keyed directly by the tape mechanism without the need for relays.**

ONE of the basic problems encountered in building code apparatus for use with Wheatstone tape is the translating of the opening and closing of the tape-operated contacts into dot-and-dash keying. Arrangements using various types of relays have been described in detail in past issues of *QST*.[1] However, there is another system which has found wide acceptance in commercial practice. This system makes use of electronic means to key an oscillator or audio tone. Relays are entirely eliminated and, along with them, a number of troubles such as limitation on speed, contact adjustments, need for relay power supply, etc., are done away with.

Commercial electronic keyers are rather complicated, often utilizing tubes difficult for the average amateur to obtain. But for code-practice purposes only the simplest of circuits is needed. The simple electronic arrangements shown in the photographs use receiving-type tubes and parts common to the average radioman's "miscellaneous" collection.

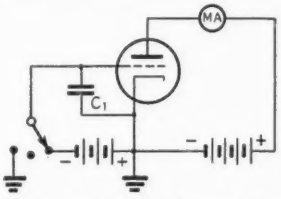
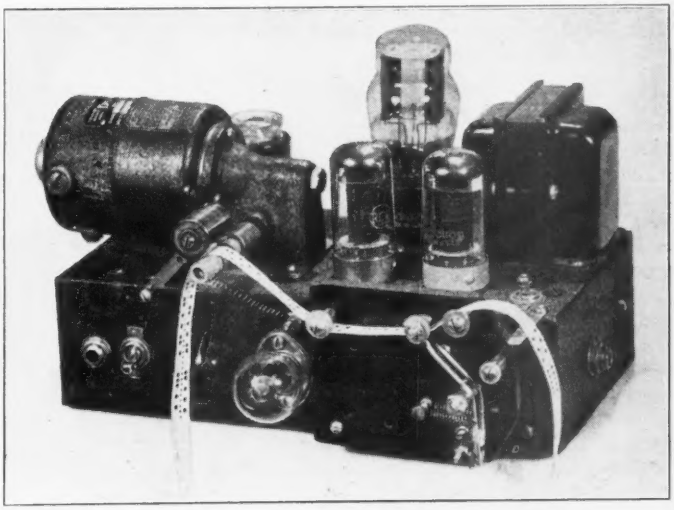



*Fig. 1* — Basic circuit of the electronic keyer. Timing of the plate-current flow is determined principally by the capacity of $C_1$ and the value of biasing voltage.

It will be recalled that, to key an external circuit from Wheatstone tape, the intermediate "keyer" must function in such a manner that closing of the tape-operated "make" contacts will close the external circuit until such time as the tape-operated "break" contacts close, irrespective of whether the "make" contacts stay closed or, as in the case of dashes, are closed only momentarily.

### *Electronic Keyer Circuit*

The elementary circuit of Fig. 1 shows the basis for the electronic "keyer" portion of the circuit. This consists of a simple triode, a source of positive plate potential, a source of negative grid potential, and a capacitance connected from grid to ground. If a milliammeter is connected in series with the plate lead, it will be found that with no voltage applied to the grid (i.e., with the grid at approximately the same potential as the cathode) an amount of plate current will flow the value of which is dependent upon the characteristics of the tube and the amount of the applied potential. If, now, a negative voltage is applied between grid and cathode of sufficient value to reduce the plate current to zero and then this voltage is removed, the plate current will not immediately return to normal because of the negative charge remaining between grid and cathode by virtue of the capacity of $C_1$. The time interval before the tube becomes fully conductive is determined by the capacity of $C_1$, the amount



A complete keyer unit with power supply and tape puller.

*15263 Raymond Ave., Gardena, Calif.

[1] Grammer, "A Code Machine Utilizing Wheatstone Tape," *QST*, p. 29, Nov., 1942; Klingel, "Simplifying the Wheatstone Perforated-Tape Code-Practice Machine," Hints & Kinks, *QST*, p. 42, March, 1943.

of the originally applied negative voltage above the plate-current cut-off value, and the leakage characteristics of $C_1$ and the associated circuit components, including the tube itself. Furthermore, if at any time we short-circuit $C_1$ while it still holds the applied negative charge, thus reducing the negative voltage on the grid to zero,

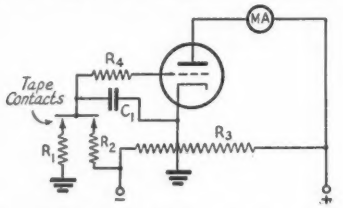



*Fig. 2* — **Circuit with keyer contacts connected to control the charge and discharge of $C_1$. Biasing voltage is obtained from the voltage divider, $R_3$.**

we can instantly make the tube conductive. Likewise, once the tube has become conductive, we may remove the shorting connection and plate current will continue to flow until such time as negative voltage is again applied to the grid. (Most tubes will show a slight change in plate current when shifting from the "shorted" to the "non-shorted" grid condition, but this has little or no influence upon the system under discussion if the recommended tube complement is used.)

With Fig. 1 as our basic circuit, if now we connect the two movable contacts of our tape "head" together and connect the stationary contacts as in Fig. 2, we can effectively start and stop the plate current of the tube in accordance with the "make" and "break" perforations in the tape. In the circuit diagrammed, a voltage divider, $R_3$, across the "B" supply is used to secure the negative grid voltage. In the timing of the circuit, there is a definite relationship between the capacity of $C_1$ and the applied negative voltage. Generally speaking, satisfactory results will be obtained when the value of $C_1$ is within the range from 0.005 to 0.01 μfd. At the same time, the biasing voltage should be adjusted to the lowest value which will maintain the tube inoperative from 3 to 5 seconds following removal of this voltage from the grid. It is difficult to specify definite values, since leakage characteristics of the tube and associated circuit components also are influencing factors, as mentioned previously.

The resistors, $R_1$ and $R_2$, connected in series with the two contact leads serve a dual purpose. First, the values chosen are such that the two resistors act as a divider network across the negative grid-voltage source whenever both contacts are closed. Under these conditions, the voltage applied to the grid must stop tube operation — a requirement necessary in the formation of dots. At the same time, the two resistors prevent the charge and discharge of $C_1$ at an excessively rapid rate, thus eliminating sparking at the contacts. The preponderance of resistance is in the "ground" leg, the ratio between $R_1$ and $R_2$ being on the order of 10 to 1 or greater. The value of the grid resistor, $R_4$, is not critical.

The circuit of Fig. 2 could be used as a vacuum-tube "keyer" by connecting an audio oscillator or amplifier in series with the plate supply. An equally effective but more economical scheme, however, is to combine the "keyer" and audio oscillator in a circuit using a single tube. This may be done by utilizing a beam-type tetrode amplifier tube. The plate, control grid and cathode function as a triode oscillator, while the screen, in conjunction with the common plate and cathode, serves as the "keyer," operating on the principles outlined above. In this case the shutting off and starting of the tube plate current electronically keys the oscillator, which is an integral part of the combined circuit.

### *A Practical Keyer*

A typical set-up incorporating this idea is diagrammed in Fig. 3. Built around a 6V6 or 7C5, the circuit is straightforward in most respects. Several points should be emphasized, however. In the first place, stable oscillator operation is absolutely necessary if the keying is to be free from chirps. Of the different oscillators tried, the familiar shunt-fed Hartley was found to be most satisfactory. The primary of a push-pull output transformer, $T_2$, is used in the inductive portion of the circuit. Output is obtained by coupling directly to the plate rather than from the transformer secondary. This arrangement gives adequate headphone level. The output of a beam tube operated with the screen at ground potential is considerably attenuated. If it is desired to use a loudspeaker, an added stage of audio will give ample volume.

The keyer portion of the circuit follows closely on the lines detailed earlier in this article, with the exception of the hand-key connection. The key functions to reduce the negative bias on the keyer grid to zero whenever the key lever is depressed. When operating in this manner the tape should

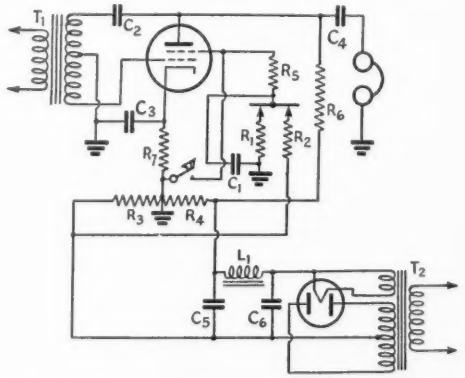



*Fig. 3* — **Combined a.f. oscillator and keyer circuit.**

$C_1$ — 0.005 to 0.01 μfd. (see text).
$C_2$ — 0.02 μfd., 400 volts.
$C_3$ — 1 μfd., 50 volts.
$C_4$ — 0.001 μfd., 400 volts.
$C_5$, $C_6$ — 10 μfd., 450 volts.
$R_1$ — 25,000 ohms, ½ watt.
$R_2$ — 2000 ohms, ½ watt.
$R_3$ — 10,000 ohms, 2 watts.
$R_4$ — 50,000 ohms, 5 watts.
$R_5$ — 10,000 ohms, ½ watt.
$R_6$ — 50,000 ohms, 1 watt.
$R_7$ — 2500 ohms, 1 watt.
$L_1$ — Small filter choke.
$T_1$ — Push-pull output transformer.
$T_2$ — Small power-supply transformer.

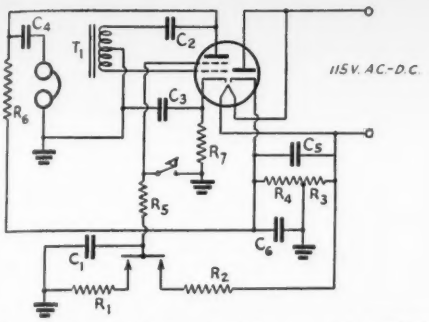



*Fig. 4* — **A.c.-d.c. keyer circuit for use with 117L7GT and similar combination-type tubes.**

$C_1$ — 0.005 to 0.01 μfd. (see text).
$C_2$ — 0.01 μfd., 400 volts.
$C_3$ — 1 μfd., 50 volts.
$C_4$ — 0.001 μfd., 400 volts.
$C_5$ — 20 μfd., 300 volts.
$C_6$ — 10 μfd., 300 volts.
$R_1$ — 25,000 ohms, ½ watt
$R_2$ — 2000 ohms, ½ watt.
$R_3$ — 1500 ohms, 1 watt.
$R_4$ - 50,000 ohms, 2 watts.
$R_5$ — 10,000 ohms, ½ watt.
$R_6$ — 10,000 ohms, 1 watt.
$R_7$ — 2000 ohms, 1 watt.
$T_1$ — Push-pull output transformer.

be removed from the "head," thus making the tube inoperative at all times except when the hand key is closed. Of course, if a commercial-type head is used, a break-in switch will be necessary. This switch should open the "make" contact lead and close the "break" contact lead. A complete code-practice set incorporating a simple tape "head," electronic keyer-oscillator, amplifier and tape puller is illustrated in the photograph on page 45.

If the builder has a 117L7GT available, the even more simplified circuit arrangement of Fig. 4 may be used. An example of a compact keyer-oscillator using this triple-purpose tube is illustrated in the second photograph. This particular set was designed for use with an external tape puller. The "head," however, is included on the chassis.

Either arrangement will key perfectly over the full range of manual speeds. In fact, perfect keying was obtained at the top speed of the tape puller used — about 95 words per minute.

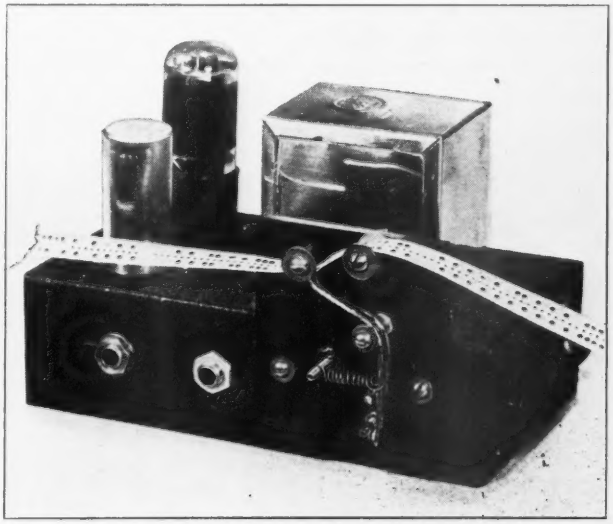
Assuming stable operation of the audio oscillator, the only probable source of trouble is the combination of negative cut-off voltage and keyer grid-to-ground capacitance. Some juggling of these two components may be required if the oscillator breaks into oscillation between words or on "blank" spaces in the tape at slow speeds. The remedy is either to increase the capacity of $C_1$ or increase the negative grid voltage. If $C_1$ has a capacity of 0.01 μfd. or more, an increase in the biasing voltage is recommended. If the trouble persists, $C_1$ and its associated circuit should be checked for excessive leakage. Another difficulty, less common but which, nevertheless, might be encountered, is failure of the circuit to make characters of constant amplitude. This is caused by too much capacity at $C_1$, too much negative bias voltage, or a combination of the two.

As pointed out earlier, chirpy keying is an almost certain indication of unstable oscillator operation. In the Hartley circuit shown this trouble usually can be cleared up by increasing the capacity of the plate blocking condenser, $C_2$.

### *Tape Heads*

With each of the keyers described, a rather novel tape head is used. Although quite satisfactory arrangements have been described in *QST*, the construction used by the writers has several advantages especially with respect to ruggedness, speed capability and minimized tape wear. Exact data will not be given, since the idea is shown quite clearly in the sketch of Fig. 5 and the detail photograph. However, a few constructional tips might be in order.

The two movable arms are made of No. 12 hard galvanized wire, bent to the shape shown and soldered to bushings which allow them to turn freely on a center pin. Contacts are soldered to the lower ends, while the tips which penetrate the perforations in the tape are shaped by filing. The shape of these tips is important, since stable keying and wear on the tape is dependent upon them. The tape end of the arm is first cut off square. Then the tape-facing side is filed back at an angle of about 60 degrees. The tip is not filed to a point but is left blunt. All sharp edges are rounded slightly. The tape moves between the tips of the contact arms and a cylindrical pillar, which is not permitted to turn. Two indentations about 1/64-inch deep are made in the under side of the pillar, so that the arm tips will drop into them whenever a tape perforation passes. These indentations must be slightly offset, since the "break" arm must operate behind the "make" arm. The tip should be capable of penetrating about 1/16 inch through the perforations. In opera-



**The a.c.-d.c. code-practice unit using a 117L7GT tube.**

tion it actually won't penetrate this distance, but the provision is made to insure operation on patched tape. The shape described permits rapid movement of the arm tip into a perforation and slow withdrawal as the forward movement of the tape tends to force the tip out of the perforation. The flattened tip face and rounded end serve to minimize tape wear.

The two movable contacts at the lower ends of the arms operate in conjunction with two fixed contacts, insulated from each other. Other details of the assembly may be seen in the photograph. The springs which maintain a constant tension on the individual arms should be made only as strong as is necessary for clean keying.

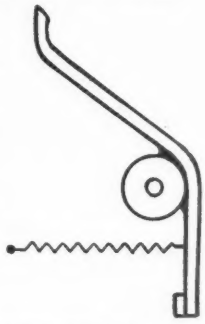
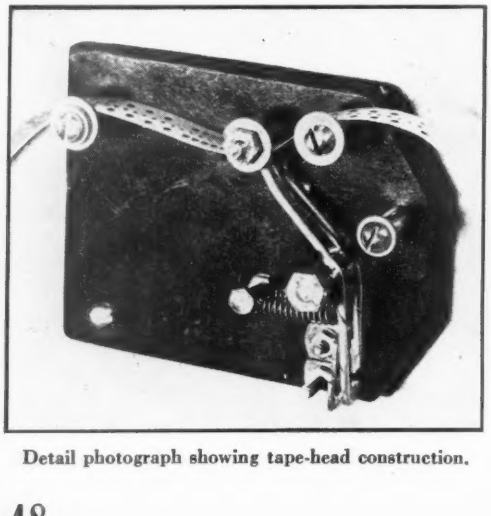


*Fig. 5* — Sketch showing construction of tape-operated movable contacts shown in the detail photograph. The contact arms are made from hard galvanized-iron wire soldered to bushings which turn on a machine screw as a shaft. The contact points are soldered to the lower end, as shown. The direction of tape travel is assumed to be from right to left across the page.

After the "head" is assembled, preliminary adjustment should be carried out as follows. With a section of tape perforated with a single dot, i.e., two holes in the same vertical plane, the lever arms must be bent so that the "break" contact will not be operated until the tape has moved forward the distance equivalent to one space *after* the initial operation of the "make" contact. One "space unit" in terms of tape movement is approximately the diameter of one of the "puller" holes which run the length of the tape along its center line. Final adjustment for keying "heaviness" can be made as soon as the head is connected into a keying circuit.

The matter of choosing a tape-puller is left to the individual. The principal requirement is uniform speed at any given speed setting. In the complete practice set shown in the first photograph, the authors used a small universal-type motor with a built-in reduction gear. A simple series rheostat provides speed control. The outfit works surprisingly well, although there is a gradual increase in speed as the motor warms up which must be compensated for occasionally by backing off on the rheostat.



Detail photograph showing tape-head construction.

A unit built around the ideas set forth in this article has given a good account of itself in code-teaching service during the past eight months. Although admittedly lacking in several features considered necessary for telegraph-circuit transmitting applications, this electronic keyer-oscillator and tape "head" should prove of interest in applications of a less exacting nature.

## New Push-Pull Beam Tetrode V.H.F. Transmitting Tube

AN improved design of push-pull r.f. beam-power tetrode, the 829-B, is now being made by RCA. Rated at a total maximum plate dissipation of 40 watts, the new type is recommended especially for use in r.f. power-amplifier equipment. It replaces the RCA 829, which it resembles in size and general appearance, but differs from the earlier tube in that it not only has a higher plate-voltage rating — 750 volts — but also an improved mechanical structure which permits use of the tube in applications involving considerable vibration.

Designed for v.h.f. performance, the 829-B contains two beam tetrodes whose cathodes are connected together inside the tube. The screens also are connected together and are by-passed to the cathode with an internal 65-$\mu\mu$fd. condenser. The heaters are connected in series with a center tap brought out to a separate terminal, so that they may be operated in series from a 12.6-volt supply or in parallel from a 6.3-volt supply.

Maximum CCS ratings in Class-C telegraph service are as follows: d.c. plate voltage, 750; total plate current, 240 ma.; total plate dissipation, 40 watts; maximum plate input, 120 watts. Typical power output is approximately 87 watts. The tube may be operated at full ratings at frequencies as high as 200 Mc. and at reduced input to 250 Mc. Less than one watt of r.f. grid driving power is required to obtain full output at 200 Mc.

In plate-modulated Class-C r.f. amplifier service the 829-B can be modulated to 100 per cent. Maximum ratings for this service are: d.c. plate voltage, 600; total plate current, 212 ma.; d.c. grid current, 15 ma. maximum; total plate dissipation, 28 watts. Typical power output is approximately 70 watts.

No neutralization is required when the 829-B is used in adequately shielded circuits. Forced-air cooling is recommended except when the "on" period of plate-power application normally does not exceed five minutes and the "off" period is not less than the "on" period.

# Hams in Combat


"Everyone off the boats!" was the order. Jumping into the water, we made for the foxholes.

## Radio Station on the Tokyo Road

**BY CAPT. F. C. BEARDSLEY,* W4DEN**

POISED on the beach at Guadalcanal, an airborne unit of the Army Airways Communications System awaited embarkation orders. Their destination — the most northern Allied airfield in the Solomons, a landing strip only in the last few hours wrested from Japanese hands. Their mission — to install a radio station for the use of Allied aircraft.

Transportation was ready at hand — not an LB-30 nor a C-47, but a good, husky sea-going barge. The airborne unit, it seemed, had for the time being turned amphibian, for this was to be a seaborne invasion.

Orders finally arrived, granting the AACS unit a priority in the "First Wave." The little party of twenty men boarded the vessel, carefully herding with them their six truckloads of precious equipment — radio apparatus, tents and personal effects. The barge shoved off. It was noon, August 9, 1943.

For once in our lives the rain and the fog were comforting factors, hiding us from wary, watchful enemy eyes and eliminating the strain of a constant overhead lookout. Even so, it could scarcely have been described as a carefree pleasure jaunt. But luck was with us, and just twenty-seven hours later the barge scraped on a New Georgia beach not far from the airport itself. We were the first Air Force unit on the island.

* APO 502, San Francisco, Calif.

The Japs had a hearty welcome awaiting us. While still about 25 yards from shore we were greeted with an air raid. "Everyone off the boats," was the order.

No one was reluctant to obey. Jumping into four feet of water, we waded ashore and made for the foxholes. That was our introduction to our new post!

The next problem was that of unloading. We had six full truckloads of equipment — and only three trucks. To make matters all the more interesting, "Charlie" popped over three times during the unloading process. No hits were scored in our vicinity, but a lot of valuable time was lost in foxholes.

Before long the Navy Seabees came around to give us a hand. The necessary trucks were provided, and after that the job was completed in short order.

It was our good fortune to be assigned to mess with the Navy, and so we selected a bivouac and made temporary camp close to the Navy's quarters.

Meanwhile frequent and heavy rains continued to fall, adding much to our enjoyment of the occasion. (Average yearly rainfall on the island: 170 inches; average number of rainy days per year: 232.)

The site finally selected for our station was about 200 yards from the landing strip. It was located judiciously near a coral knoll for protection from bomb blasts. To the rear was a small hill which had been nicely furnished with dug-outs by the Japs. One of the better holes served as "Base Operations."

Using Jap rifle barrels as tent pegs, we erected two large tents to house the radio station. Main-

### *U. S. War Bonds for Stories of War Service*

***QST* wants reports on the experiences of radio hams in active service on the battlefronts — for immediate publication in this section, where feasible, or to be held confidential where security considerations so require.**

**Do *you* have a story of war service to tell — either your own or that of someone you know? Then write us a letter giving full details, including photographs, clippings and other substantiating data where available. If your story is published in *QST*, you will receive a $25 U. S. War Bond. Please indicate clearly on the report if it is available for publication in its entirety, if names, dates or places should be deleted, or if all information must be held confidential.**

tenance personnel immediately set about installing equipment. We were eager to get the station on the air!

The proximity of the Japs — just one-half mile away, to be exact — became apparent almost immediately. Every day the distance increased, but we were still close enough to smell 'em — and that's too close for comfort, especially when you are trying to build a radio station.

All went reasonably well for the first few days. We had only about ten air raids a day — just enough to keep us busy leaping in and out of foxholes. Then, one evening as we sat in our tents, we heard "whoosh-wham!" — a direct hit on the sick bay, killing the only patient. Everyone else dove for his foxhole.

The Jap artillery had decided to take a hand. The first salvos struck all around us. I hit the dirt, and for the first time in my life I wished I were a smaller man. My "fanny" seemed to stick up a mile in the air. A shell landed on either side about 20 yards away, and another broke overhead. Shrapnel pounded the mud like rain.

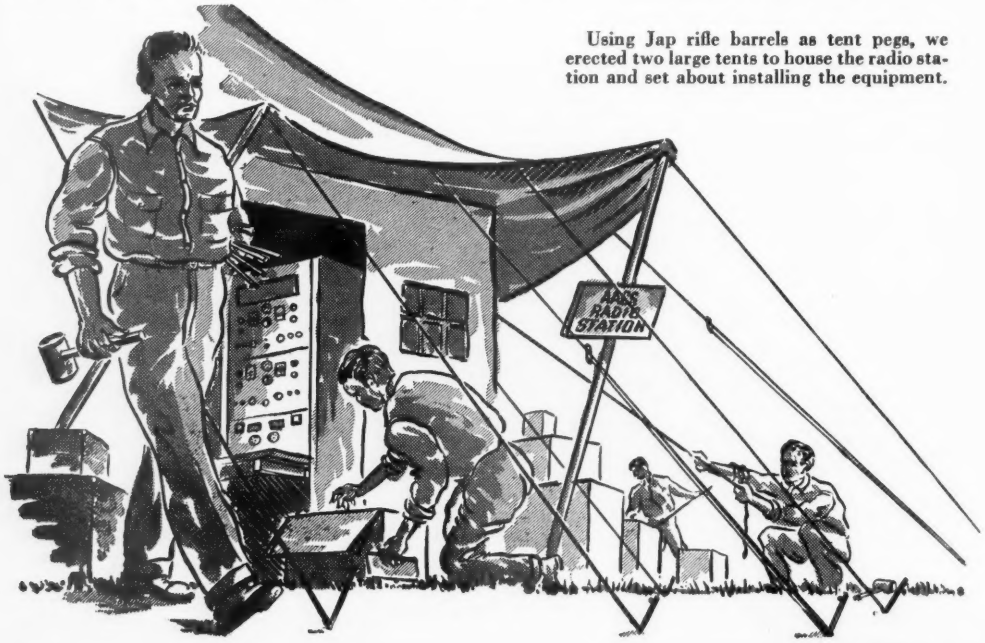
I decided to move. I got up, started running — and made the rest of the distance to my dugout in nothing flat! I reached it all intact, but my uniform was covered with blood. A gang of Seabees who had dropped with me hadn't got up again. . . .

Water was at a premium, and sanitary facilities were non-existent. The food got worse and sterilization of mess equipment was impossible. The base commander ruled that no clothes were to be washed. Much sleep was lost. In the intense heat, nerves and bodies weakened. Sick, tired and dirty, the men nevertheless stuck to their chores with the grim determination of American soldiers everywhere.

Piece by piece the station went together. Knowing not only that must we get on the air but that we must stay on the air, appropriate protective measures were adopted. Joking, swearing, working like old-timers with years of battle experience, the men erected a log wall four feet high all around the tents housing the station. A bulldozer pushed coral rock up to the top of the wall, and our station was thus made splinter-proof. Men and equipment were well protected from anything except a direct hit.

At last it was done. Eight days almost to the hour after the landing strip was first wrested from Japanese hands, a complete radio station of the Army Airways Communications System was open for business — coming in strong and clear at Guadalcanal.

The first Air Force unit on the scene had established the first radio communications from the new Allied airdrome in the South Pacific.




**Using Jap rifle barrels as tent pegs, we erected two large tents to house the radio station and set about installing the equipment.**

# In England with the CTC

**BY J. H. FULTON,* W7IKF, EX-W9GNL**

BACK in the early summer of 1941, when radiolocation was first announced, you will remember that U. S. hams were invited to come to England and help run it. Later the organization established — the Civilian Technical Corps — was expanded to include all of the trades open to men of the RAF ground staff.

Well, I was one of the first American amateurs to join up. A good many of the fellows in the original crew have transferred to the U. S. Army and civilian groups maintained by American firms in the British Isles, but I am still with the outfit.

I made my first inquiry at the British Consulate in Portland, Oregon. There I was given an examination much like a civil service exam, and in a week or so I was sent a railway ticket and subsistence money. At Montreal I was fitted with a regular RAF uniform, except that it had black buttons instead of brass and the letters "CTC" instead of an eagle at the shoulder. I spent two weeks at Montreal billeted with hundreds of others, including hams from all states of the U. S. We even had a QSL section where everyone reproduced his card in pencil on the wall.

The journey across was quite exciting at the time, although perhaps it would be dull reading now. Just before we left, a ship carrying CTC recruits was torpedoed and 19 members were lost. However, no one backed out to go home after hearing this. I was sent to an eastern port in a group of 75 and remained at a large RCAF embarkation camp for two weeks before sailing. The last four or five days we were kept in constant readiness for instant embarkation.

One Sunday afternoon I was sitting in the canteen reading an ancient magazine when the radio music subsided in a breathless pause — followed by the first announcement of Pearl Harbor. I rushed right into our barracks but none of my pals would believe the news. However, they soon learned that it was all too true.

We sailed the next day on a fairly large liner built for the African run. There was a row of electric heaters in the passage, but all the electrical power available was needed for the magnetic-mine protection gear. We were warned always to remain fully dressed day and night, and to keep our lifejackets handy.

The ship was near the rear of a huge convoy. Some of the fellows figured by the position of a dim object which looked vaguely like the sun that we had turned about and gone west for a couple of days, but I doubted that. Anyway, it was sixteen days before we saw land. The ship's radio room would prepare a daily news sheet from press reports received by radio, but none of us was allowed near the radio room on any pretext. I can remember a feeling of deep exasperation one day when half the sheet was filled with details

I was sent to a smallish factory which manufactured new scientific devices developed by the labs.

of the birth of a child in a remote branch of the Royal family — while all we wanted to hear was news of MacArthur and the Philippines!

I didn't become seasick, thanks to my cruise with the USNR that previous summer, but the weather was pretty foul most of the sixteen days. The ship was designed for higher speed and couldn't be steered properly at convoy speed, so we did a lot of pitching and tossing. We amused ourselves by reading, walking about the deck, reading blinker signals from the escort, and taking liquid refreshment at the bar. Needless to say, this last was overdone on several occasions.

Finally we sighted some of the bare rocky islands off Scotland. After sighting land everyone began to feel easier at first, for it meant that the submarine menace had become remote. But then, when the ships began flying kites and balloons, we were reminded that now we were within dive-bomber range.

We passed up a great river estuary and could begin to see houses and signs of life on shore. Everyone shouted with delight on seeing the first double-decker bus and commented on the "sawed-off" railway freight cars. There were a number of Englishmen on board — RAF fellows and businessmen. As we passed through a shipyard they whistled at their compatriots ashore, holding both "thumbs up." We didn't go ashore the first night nor the next day until nearly dark.

Our luggage consisted of a kit bag and suitcase each, together with whatever we chose to strap about our persons besides the gas mask. We had to be able to move about carrying all our belongings in one go.

Very suddenly we were rudely introduced to the blackout. In the dark in a strange place we were herded out of the docks and into buses, which promptly took out at reckless speed into the dark — and on "the wrong side of the street," to boot. These took us to a railway station, where we loaded our kits into a baggage car, and then to a near-by hotel for our first British war-time meal. It was much better than I'd been led to

*C/o Commandant, Civilian Technical Corps, 111 Strand, London W. C. 2, England.

expect. I no longer remember all the details, but there was butter and jam as well as good soup.

On Christmas Eve of 1941 we went back to the station and into a waiting train, which didn't seem much different from the American kind. There were no sleeper cars. We traveled all night with shades drawn, unable to see outside. As the first light of Christmas morning arrived, we pulled into London. There was a long wait in the station with no breakfast. Finally we piled into more buses and across London to another station. They took us to a British Soldiers' Club for breakfast and we purchased a few trinkets at shops in the Club. Our reception depot was at a South Coast town, and we spent the rest of the daylight getting there. After checking in at headquarters with all kit, we had our second meal of the day — which the RAF fellows called "tea" but which to us was Christmas dinner.

The English were disposed to give us a rousing welcome, and I think that the rations dished out in that reception depot were far in excess of anything specified by the rules and regulations. Back home I had been among the unemployed, and now here I was in a war zone, eating more and better food than I'd seen in a long time.

Everything was new and exciting. We had lots of freedom the first few days and wandered all over the towns lying in a group near by. The bus service was excellent and cheap. I bought a bicycle right away, having been told that it could be taken with me on all rail journeys. I still have it today, and the mileage ticker on the front fork reads 7300 miles!

Each of us was interviewed by a series of RAF, Army and Navy officers. I was placed with the radiolocation group and sent to an RAF school in Lincolnshire to learn about the technique. There were six others from my ship in the same class, and in barracks near by there were many other CTC men from both earlier and later ships.

The course was twelve weeks long, and we studied each piece of equipment thoroughly. Some of it proved to be extremely complex, the more so because of the unfamiliar English tubes and bases. We lived right with the RAF and under the same conditions as the airmen of the RAF, except that we were not required to do "square bashing" and like military routine. There were two huge NAAFI canteens and several YMCA and Salvation Army canteens about. The heating was very bad in the barracks, and so "Naffy" was very popular of evenings. Usually there was a concert or a Eusa show, as well.

It was now midwinter and even the classrooms were heated badly, if at all. I put on both suits of winter underwear and went to class in my overcoat. Sometimes the blackboard was obscured by steaming breath. The mess hall was an eerie sight of a frosty morning, breaths steaming, tea mugs and porridge plates steaming, everyone sitting hunched up in his overcoat eating breakfast — and those tea mugs! They held more than a pint and were lettered "RAF" on the side. Food on large stations wasn't very good, but it was pretty decent on small stations with WAAF cooks.

I can't give much of interest about the technical details learned in the course. On "graduation" I was sent to a real radiolocation station on the south coast.

My work was quite simple and a bit tedious. There was a fixed routine of apparatus to be taken down for inspection and cleaning. We operated on a "3-watch system." During a period of three days we worked a total of 24 hours on and had 24 consecutive hours off duty. This made for great irregularity in meals and sleeping. Camp was several miles from the station and a lorry carried the watches on and off. I wonder if any American WACs now ride in lorries over the dark roads like the WAAFs rode with us. . . .

Up to then I had not so much as heard an air raid siren. I did not hear any there right away, although there were some raids. Naturally the station buildings were well sandbagged, being air raid shelters in themselves. The telephone operator would inform us when a raid was indicated. I was in the transmitting part and couldn't hear the receiving operators except on the occasions when I went into the receiving place to see what was going on. It was most interesting when one of our intruder patrols went out.

It was while I was in a large town one day that I first heard the air raid sirens. I promptly got badly scared, and began nervously scanning the sky and looking for a shelter. Then I noticed that everyone else was quietly going about his business, paying no attention to the wailing siren. Later I developed the same nonchalant attitude. With all the tooting there weren't many bombs. I remember waking up one morning with the sensation that someone had lightly kicked my cot. They were dropping a few on a village ten miles away. One never saw any enemy planes on these "sneak and run" raids — or at least I never did.

I was for a time the only CTC or American of any kind on this station, and as a result was a great curiosity among the natives. While I was offered a civilian billet, I chose to live in the RAF camp, and now I'm very glad I did.

After three months on this station, I was recommended by my CO for more technical work. I was sent to a smallish factory which manufactured new scientific devices as they were developed by the research labs. This job was rather disappointing because of security regulations. No [censored] piece of apparatus being made was for or how it worked. Elaborate precautions were taken — so elaborate that even essential information sometimes was witheld. I remember one occasion when I was told to wind some coils to a specified inductance. The only measuring instrument was a *Q*-meter, and to use it I had to know the frequency at which the coils were to be used. This, however, they wouldn't tell me, for it was secret info. Such complications made it rather hard going at times.

Nevertheless, I made myself quite useful about this factory. I developed my own methods of making various intricate parts, although coils were my specialty. I became familiar with English factory

*(Continued on page 98)*

# EXPERIMENTER'S SECTION

Address correspondence and reports to ARRL, West Hartford, Conn.

## PROJECT A

### *Carrier Current*

I AM a radio technician with the Alaska Communications System, stationed in Skagway. Broadcast-band reception on ordinary home receivers is nil here. We now have in operation a simple carrier-current rig of the oscillator-amplifier type, coupled into the town's power line. It was operated at first on the low-frequency end of the broadcast band, between 550 and 600 kc. The oscillator is a 6C5 and the final amplifier is a 6V6. The modulated high voltage from a Wilcox-Gay recorder is applied to the plate of the 6V6.

The special service division of the War Department has an office here, and they are much interested in our set-up. The officer in charge recently checked with the FCC office in Juneau. They said that, since the radiation was below their minimum restrictions, the operation was not under their jurisdiction and it would be necessary only to obtain the official approval of the commanding officer of the military area. We have this in writing. Everyone seems to be behind us and willing to coöperate. The townspeople appreciate hearing something on their more-or-less useless broadcast receivers.

After approval was obtained, we shifted frequency to the center of the broadcast band, at 900 kc. [Other experimenters should realize that use of this frequency for c.c. operation is permissible only under the special conditions outlined by Pfc. Bunnell — EDITOR.] We use the self-assigned call KSKA — K for the district and SKA for Skagway. We have a staff of four operators besides myself, and are on the air nine hours each day. We are now moving our studios to larger quarters and are building a new transmitter.

Since c.c. is as close as possible to the old ether-burning, the increasing interest among amateurs in these times is understandable. I certainly enjoy the "Project A" articles in the Experimenter's Section and hope that you will keep it up and enlarge upon it. Of course, we would like to hear from others in this locality who may be interested. — *Pfc. Gordon Bunnell, ACS, K7LSPH, Skagway, Alaska.*

—···—

I am not an amateur but am very much interested and expect to become licensed when the war is over. Just now I am interested in c.c. transmission and would like to contact others in my area. — *Granville P. White, Wilmington Manor, New Castle, Del.*

I have been reading the c.c. notes in *QST*. Before I joined the Navy I did some experimenting using an old 205 tube as the oscillator. It was grid-modulated. The entire transmitter was shielded, to minimize broadcast-band interference from the oscillator tank circuit.

The receiver was a "Sky Buddy" with a converter. The latter used an 1852 and a 6K7. Both telephone and a.c. lines were tried, the telephone line proving better for stations at greater distances. — *Robert J. Cook, SRM2c, Unit K, Tent 90, Camp Bradford No. 3, Norfolk 11, Va.*

—···—

We have progressed far since my last report on activities in Lyndhurst. W2OKE designed a swell c.c. rig using a 6V6 oscillator and 6L6 amplifier, plate-modulated. This has been heard seven miles from the QTH of W2OKE, running 25 watts input. A 10-watt amplifier is used as a modulator. WW2LAM is now using a rig similar to mine. We are on the air daily around 7 P.M. and usually on Sunday mornings.

The rig uses a Hartley oscillator capacity-coupled to the 6L6. The tank coil is the same as that described in March, 1942, *QST*. It is tuned by a four-gang b.c. condenser, using about 1200-$\mu\mu$fd. capacity. The coupling link is adjustable, enabling us to load up the rig easily. The link coil consists of about 10 turns of hook-up wire with a 0.25-$\mu$fd. condenser in series with each lead. Anyone desiring further technical information on our rig is welcome if a stamped self-addressed envelope is enclosed with the request. — *Bob Stankus, 435 Post Ave., Lyndhurst, N. J.*

—···—

We would like to hear from anyone in this vicinity interested in c.c. — *Dean Morrison, 2801 Hiawatha St., and Roy Lambert, 1411 New Jersey St., Kansas City, Kansas.*

—···—

I am now ready to go on c.c. in Providence. My transmitter is a Hartley oscillator with 300 volts on the plate of a 6L6. The frequency is about 180 kc. No contacts have been made as yet. — *Joseph P. Feehan, 401 Orms St., Providence, R. I.*

—···—

I enjoy the Experimenter's Section every month, particularly the dope on c.c.

I believe that, if tuned couplers were used to match the transmitter to the line, better results would be possible. Activity is practically nil around here. I would like to hear from interested experimenters. — *Edward J. Reilly, 335 Coiltsville Rd., Campbell, Ohio.*

# Pine Notch Ponderings

***The Philosopher of Polecat County Does a Little Ruminating***

**BY "SOURDOUGH"**

ALONG towards the end of the month Martha always tries to get down to the box first to get the mail. When *QST* shows up she puts it away and won't let me look at it until the supper dishes are done. She's mighty strict about it, too. Guess it's because of the day I got so interested that somehow the cows didn't get fed nor the potato patch weeded.

After supper we usually sit by the fire (it gets right cold up in Pine Notch this time of year) and read and talk until ten o'clock news time. After the news we go to bed. That's staying up right late for country folk, you know.

Well, this morning Martha is real sore. I got buried in December *QST* last night and didn't get to bed till after midnight. She says it's as bad as them DX contests used to be. Anyhow, after she put the cat out and went off to bed, me and old Pete — that's my setter — we set by the fire companionable-like while I smoked my pipe and thought about some of the things in that there December issue of *QST*. They sure was worth some old-fashioned, homespun, grass-root philosophizing.

You take that letter from that Marine Corps captain "somewhere in the Pacific." He says the hams are doing great things out there. Now this captain is the feller who is *there*. He is the *only* sort of feller can weigh up what the final, tried-down, basic value of the ham spirit is. Being a captain in the Marines, you can bet your hopes of Heaven that his judgments are measured by Marine standards — than which there ain't no higher.

One of the great things in his letter is that he don't call amateur radio a "hobby." He calls it


an "institution." Well, just to make sure, I dusted off the dictionary and looked up that word "institution." Take it from me, that captain sure knows his English. Here are the definitions — you fellers judge for yourselves:

"That which is established, especially an established rule, custom, principle. . . . An organized body or society for promoting a particular object especially of . . . an educational nature."

For my money, "institution" is the better word.

If I could have one wish right now, it'd be that any big shot or politician who has an idea that he'd like our bands after the war should suddenly find himself beside that captain out there "where the bombs are falling." Maybe between bombardments he could sort of explain his idea to the captain.

Just think. Here's an officer who has a war to fight. He has all the worries and responsibilities of command — not to mention odds and ends like snipers, shelling, malaria and all the other horrible things of a tropical war. In spite of all these burdens — more than enough for any man — he finds time to write home a letter to build up *our* morale.

Guess we should be pretty humble about that, and maybe make up our minds that this captain and his men will on no account be disappointed in their expectation that they will get back on the air when this war is over. I'd sure like to see that every congressman and every senator there is had a copy of that letter — or maybe fifty copies.

Then you take "Hamfest in Khaki II." Did you notice that in this group of hams some of them was senior officers and some of them very second-class privates? There they sot, all talking it over as *hams*. Now that's real democracy for you. Imagine a hun "Herr Ober" (that's a colonel — I think) arguing with a lowly "Feldwebel" (that's a corporal — I think) over the merits of e.c.o. vs. crystal control. I calculate that kind of a situation would take more imagining than any of we'uns have.

That was another swell letter from that flying instructor, W9NXU, about how we used to apple-polish our reports before the war. All you fellers know how many hundreds of times some guy said "599 plus" and then asked for repeats. Now this flying instructor had the tough job of taking a lot of husky young Americans and teaching them to fly. In that job he had to be *honest*. Not just legally "honest" but real sure-'nuff bedrock honest, to save those kids from making mistakes that would kill them and cost us one fighting effective.

Just as he says — when them kids got shown what they was doing wrong, they fixed it up in short order. 'Course, them kids wanted to learn. I knew a right smart bunch of hams who had an idea they didn't have nothing left to learn. Now if one feller was to report that their sending is lousy, them guys would shrug it off. But if every

station they worked really stuck to the exact truth and told 'em straight out they was no good — wal! I reckon they's damn few of us around stubborn enough to stand up to that kind of treatment very long.

We'uns up here in the Notch used to think that them fellers over on Tamarack Flats (where young Cyrus what's a top sergeant comes from) was a pretty queer and shifty lot. One day the bottoms took afire and we all went down to fight it and so did they. It was quite a tussle for a time, but in the end we got 'er slowed down. When we got the fire under control the women-folk come around with eats and cider and such. Well, 'twasn't long before them Tamarack Flats boys and us got to talking things over easy-like. We was all pretty tired, and anyhow the cider was a mite on the hard side.

Pretty soon we found out they was made just about the same as us and had pretty near the same ideas, and on the whole was pretty good fellers to have around (though they *are* right smart hoss traders . . .).

WHEN WE GOT THE FIRE UNDER CONTROL THE WOMEN FOLK COME AROUND WITH EATS AND CIDER AND SUCH

Seems to me it's about the same with the whole world. Our fellers, 'cording to those "Ham Hospitality" pieces in *QST*, get to meet fellers right in their own homes out in Ireland and England and Brazil and Australia. From the photos they look like they was all pretty happy about things, and if t'warnt for the uniforms you couldn't tell one from t'other.

Come the day (as come it will) when we get back on the air, there are sure going to be a lot of stations calling all sorts of places all over the globe. But they ain't going to be calling casual-like just for a QSL card or so they can boast about it at the next DX meeting. Heck, no! They'll be a'calling so they can ask some VK how that YL they met in Sydney that summer is getting along — or if the Señor in Brazil has tried that new 20-meter beam they talked about, or even if Donnigan in Belfast has been able to prove yet that he can drink more beer than Moriarity so they can win that bet they made one cold night in '43. . . .

Well, along about then the coals began to die down and old Pete nudged me as much as to say that I'm a dreaming old fool, which I am, and should be in bed. But — old or young — I sure like to dream about the days when that old radiation meter will read again!

★ ★ ★ ★ ★ ★ ★ ★

# Gold Stars

SGT. EDWARD R. STEVENS, K7BC, ex-W7BB, 36, was killed when the Army airplane in which he was a passenger crashed near Sitka, Alaska, on July 21, 1943. One of the best-known W7s, Ed Stevens received his first ticket in 1914. Thereafter he held several calls, 7BB making its first appearance on the air from Seattle, Wash., in 1926. He also operated other ham stations, among them NA7AP, K6CB, YS1AP and C9BG. A prominent 40-meter man, K7BC's main interest lay in DX. He had worked most of the countries of the world. He worked the various Byrd Antarctic expeditions and participated in the Jimmy Mattern rescue when the flier landed in Siberia. He was a seagoing radio operator for four years and helped install police radio systems in Seattle and San Francisco.

Ed Stevens enlisted in the Army in 1940, continuing to operate K7BC until Dec. 7, 1941. At his death he was chief operator at the Alaska Communication System station at Sitka.

L. LYON COOK, W4HJZ, ex-W3BDH, 28, was killed on July 23, 1942, when the merchantman on which he was radio operator was torpedoed and sunk in the Caribbean. The freighter was on its return trip from Puerto Rico when the captain sighted an approaching torpedo. At the instant he gave the warning the torpedo struck, destroying the whole center of the ship and blowing those on deck overboard. There was no time for an SOS; the heavily laden ship sank in less than a minute. Only those who had been thrown overboard were saved. W4HJZ, still at his post of duty, went down with his ship.

An ardent amateur, W4HJZ made radio his career. He graduated from the Radio Institute of America and later received a B.S. in radio engineering. He held a 1st-class commercial ticket and had served for 5½ years with the Grace Line. He had also operated for the Eastern Air Lines, on Vanderbilt's *Alva*, and on ships of the Ford Motor Company.

★ ★ ★ ★ ★ ★ ★ ★

# STRAYS

A definite program for the production in the first quarter of 1944 of at least 4½ million receiving tubes for civilian use has been announced by WPB's Radio and Radar Division. Critical types which are now being pushed are 12SA7, 12SQ7, 12SK7, 50L6, 35Z5, 35L6, 1H5, 1A7, 80, and others which have not been produced in sufficient numbers because of military requirements. These tubes will be marked "MR" and will be used for maintenance and repair purposes.

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A new type of low-frequency piezoelectric crystal, which can be ground to better than one part per million per degree Centigrade drift, has been developed by the James Knights Co. of Sandwich, Ill. It has unusual activity and can be made to vibrate on both the low and high modes, so that dual frequency crystals can be readily produced. By contour grinding the crystal can be lowered or raised in frequency, and consequently the exact adjustment of frequency is easily accomplished. Frequencies as low as 10 kc. and as high as 300 kc. have been produced with good results. The crystal can be used in air-gap mountings or can be plated and clamped at the nodal point.

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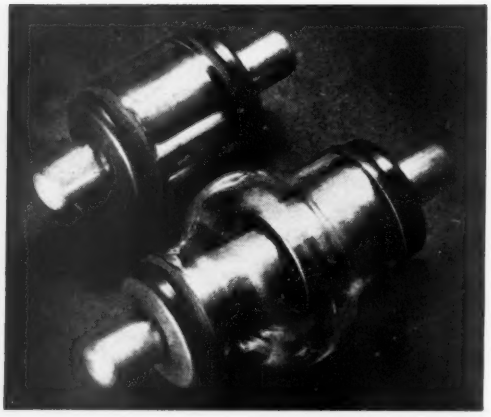
Shown in the photograph below are two of the four new vacuum capacitors, designed for use in circuits with peak voltages ranging from 7500 to 16,000 volts, which have been announced by the General Electric Co. A major feature of the new units is their small size, of importance in the design of high-frequency circuits. The capacitors are comparatively loss-free, since there are no losses in the vacuum dielectric, and the total capacitance is lumped into a volume of about one cubic inch.

Further details are available in publication ET-2, which may be obtained free on request from GE at Schenectady, N. Y.



According to the New York *World-Telegram*, one Edison Bowman, a Navajo Indian bronco buster, credits his Western accent for an assignment to radio work in the Signal Corps.

It seems that, when he joined the Army some eighteen months ago, he told an interviewing officer he was a "rodeo hand."

The officer nodded. "Radio ham," he wrote, and proceeded to assign the erstwhile cowhand to radio duties.

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The new Signal Corps sound-powered telephone, which operates entirely without batteries, proved to be one of the most useful items of communications equipment on Guadalcanal, according to Signal Corps officers. Power in the telephone is generated by whistling into the transmitter. The effective range is five miles under most circumstances and ten miles under favorable conditions.

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The radio transmitter which broadcast the 1937 solar eclipse from a tiny atoll in the South Pacific recently was used in a news broadcast from Naples — the first Allied transmission from continental Europe since Dunkirk. Nicknamed "The Relic," the transmitter entered military service in 1942 and was shipped to North Africa. It arrived in time for the invasion of Sicily and was set up in Syracuse, where it sent press copy to Allied Force Hq. Sent to Bari soon after the invasion of the Italian mainland, the five-ton transmitter eventually was shipped to Naples where, on Nov. 14th, it broadcast a news program from the Advanced Press Headquarters.

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Foreign short-wave broadcasts totalling 50 million words were recorded by CBS during 1943 — an average of nearly a million words a week. Broadcasts were recorded from some 35 different points all over the world.

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Signal Corps soldiers stationed in the British Gold Coast in Africa are using stock-room shelves made of solid mahogany. This valuable wood grows so profusely in the region that it is cheaper to use it for such purposes than to import less expensive woods.

The same troops have radio antenna towers made of spliced bamboo poles, another wood which grows plentifully in the region. Each part of the tower is made of four 25-foot bamboo sections lashed together.

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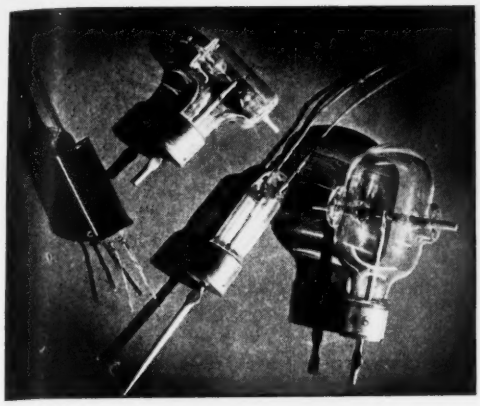
The trouble with lotsa them DX hounds use'ta be that they hollered QRM when they shoulda hollered QRS.

— *"Eddie Current"*



Shown above are the four new vacuum switches which have been announced by the General Electric Co. The contacts are mounted in a vacuum, making them relatively free from the effects of corrosion and arcing, and are unaffected by dirt or oxidation. The vacuum-type construction also gives the switches a high current rating for their size and permits them to handle enough power to operate equipment at greatly reduced voltages.

Details are available in publication ET-1a, which may be obtained free on request from GE at Schenectady, N. Y.

## Radio Historical Quiz

BY ROBERT COBAUGH,* W2DTE

How good is your knowledge of the historical background of the radio art? How did the terms we now bandy about so freely — ohms, henries, and all the others — originate? Who discovered the fundamental principles of radio and electricity, and when?

Test your knowledge by the following questions. You should answer at least five correctly for an average score; seven or more right would be an excellent showing. Correct answers are given on page 98.

1. Who was responsible for the development of the coherer as a detector?
2. Who was the first ham?
3. When was the first electric bell invented and by whom?
4. Who was granted the first patent for a system of wireless telegraphy, and when was it issued?
5. Who first predicted the action of electromagnetic waves?
6. Who first sent human speech through space without the use of wires?
7. Who invented the superregenerative circuit?
8. Who invented the superheterodyne circuit?
9. Who invented f.m.?
10. Who first noticed that electronic current would flow in a vacuum from a heated filament to a plate, but not in the reverse direction?

*3534 Bell Blvd., Bayside, L. I., N. Y.

## WWV Schedules

STANDARD-FREQUENCY transmissions are made available as a public service by the National Bureau of Standards over its standard-frequency station, WWV. The service is continuous at all times, day and night. The standard radio frequencies transmitted are:

5 megacycles ( = 5000 kilocycles = 5,000,000 cycles) per second, broadcast continuously.

10 megacycles ( = 10,000 kilocycles = 10,000,000 cycles) per second, broadcast continuously.

15 megacycles ( = 15,000 kilocycles = 15,000,000 cycles) per second, broadcast continuously in the daytime only (i.e., day at Washington, D. C.).

Each of these radio frequencies carries two audio frequencies at the same time: 440 and 4000 cycles per second. In addition, there is a 0.005-second pulse, heard as a faint tick, every second. These pulses may be used for accurate time signals, and their one-second spacing provides an accurate time interval for physical measurements.

The audio frequencies are interrupted precisely on the hour and each five minutes thereafter, resuming after an interval of precisely one minute. This one-minute interval is provided to give the station announcement and to afford an interval for the checking of radio-frequency measurements free from the presence of the audio frequencies. The announcement is the station call (WWV) sent in code, except at the hour and half hour, when it is given by voice.

The accuracy of all the frequencies, radio and audio, as transmitted, is better than a part in 10,000,000. Transmission effects in the medium may result in slight fluctuations in the audio frequencies as received at a particular place; the average frequency received, however, is as accurate as that transmitted. The time interval marked by the pulse every second is accurate to 0.00001 second. The 1-minute, 4-minute and 5-minute intervals, synchronized with the second pulses and marked by the beginning and ending of the periods when the audio frequencies are off, are accurate to a part in 10,000,000. The beginnings of the periods when the audio frequencies are off are so synchronized with the basic time service of the U. S. Naval Observatory that they mark accurately the hour and the successive 5-minute periods.

During a winter day good service is given on 5 Mc. at distances from 0 to about 1000 miles, on 10 Mc. from about 600 to 3000 miles, and on 15 Mc. from about 1000 to 6000 miles. In general, reliable reception is possible at all times throughout the United States and the North Atlantic Ocean, and fair reception over most of the world.

Information on how to receive and utilize the service is given in the Bureau's Letter Circular, "*Methods of Using Standard Frequencies Broadcast by Radio*," obtainable on request. The Bureau welcomes reports of difficulties, methods of use, or special applications of the service. Correspondence should be addressed to the Director, National Bureau of Standards, Washington, D. C.


## HANDY CALCULATOR FOR TIME CONVERSIONS

WHENEVER there are time conversions to be made, as is frequently the case in international communications, the old aspirin bottle is apt to take quite a beating. There should be a simple device for changing a given time at one location to the exact time anywhere else on the globe for that moment. Any change in the date likewise should be indicated.

Several types of calculators have been devised for this purpose, but some of them are a bit confusing. When I failed to find a suitable device in the stores, I set to work on the design of the calculator shown in Fig. 1. It consists simply of a rotating disk pivoted on an indicator card. In my model the material is white cardboard, the disk being 6 inches in diameter.

The circumference of the disk is divided off into 72 equal divisions. These divisions have been grouped into three segments, so that they represent successive hours of any three days. For convenience, the three days have been labeled "Yesterday," "Today" and "Tomorrow." Each segment is colored differently, so as to be readily distinguishable. The hours of each day are numbered consecutively according to the 24-hour clock system used by the military and naval services. Of course the familiar 12-hour division into "A.M." and "P.M." may be used instead; in that case the sectors might well be further subdivided to indicate the distinction between morning and afternoon hours by the shading of alternate 12-hour periods. The 24-hour system is convenient, however, in that the consecutive numbering of the 24 hours simplifies many computations, and it now is standard in many countries. Examples of the notation used in this system follow: 7 A.M. is 0700 hours; 2:30 P.M. is 1430 hours; midnight is 2400 hours today or zero hours tomorrow.

On the indicator card there is a sector of 25 divisions laid out to coincide with any equal number of hour divisions along the edge of the rotating disk. The indicator divisions represent the standard time zones, east and west of the meridian of Greenwich. They are numbered + 1 to + 12 counter-clockwise from the central or zero division, and clock-wise thence from − 1 to − 12. Just above these divisions is a scale which indicates the central meridian of each time zone in degrees of East or West longitude.

By means of a simple adjustment of the disk with respect to the indicator scale, the time at any point on the globe can be converted to the time at any other point. At the same time, an automatic indication is given as to whether any change of date is involved, the date being given in terms of "Yesterday," "Today" or "Tomorrow."

In use, a selected hour, which may be the time at the observer's location or any other location under investigation, is located on the "Today" sector of the disk and this point on the disk is set opposite the indicator time-zone division whose central meridian is that of the standard time zone for the given location. Then, opposite the indicator division representing the time zone which is the subject of inquiry, the corresponding hour for that location will be found with the

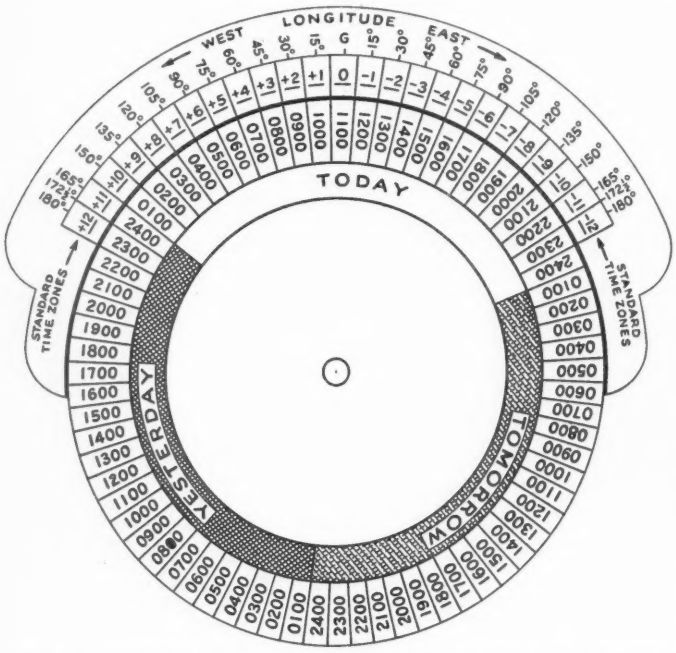



*Fig. 1* — Calculator for time conversion. The Hour scale is on a rotating disk. Shaded portions represent colored segments in the original model.

date indicated in terms of "Yesterday," "Today" or "Tomorrow," as the case may be.

As an example, Fig. 1 shows the dial set so that 0600 hours (6 A.M.) is opposite the time zone in which Washington, whose central meridian is 75 degrees West longitude, is located. If at 6 A.M. in Washington it is required to know the hour in Cairo, Egypt — which is in the −2 time zone and whose central meridian is 30 degrees East longitude — it may be seen that the hour shown on the disk opposite the indicator division for that time zone and meridian is 1300 on the "Today" scale. Therefore, when it is 6 A.M. in Washington the time in Cairo is 1 P.M. of the same day.

As another example, the time in Kiska in the Aleutian Islands at the same 6 A.M. hour in Washington is 11 P.M. *yesterday* — or rather, it would be if the International Date Line, that imaginary mid-Pacific track where our yesterdays are supposed to become tomorrows or vice versa, had not been bent westward in order to include the Aleutians in the same time zone with Nome and other points in Western Alaska. Actually, the hour on Kiska is 12 midnight, the beginning of *today*. There are many departures from the demarcation of standard time zones by meridians throughout the world. A table or chart of time zones showing these arbitrary variations is required to determine the *clock* time in cases where the time zone of the distant point is not part of the observer's knowledge. This calculator will always show the approximate *sun* time for any place whose longitude is known.

A shift of the dial to set a later hour of the day, such as 4 P.M., opposite the local time zone on the indicator (continuing to assume this to be the one determined by the 75th meridian, West) will show that at 4 P.M. local standard time the time in Bombay, India, is 2 A.M. *tomorrow*.

A turn in the opposite direction, setting 1 A.M. opposite the 75th meridian, reveals that the corresponding hour in Honolulu would be 7 P.M. yesterday — if the standard time meridian were applicable. However, a table of exceptions lists the Hawaiian Islands as observing a one-half hour difference, using 157½ degrees West longitude as a standard meridian. The time in Honolulu, when it is 1 A.M. at Washington, is therefore 7:30 P.M. yesterday.

New Zealand and adjoining islands use the 172½ degrees East longitude meridian. Central Australia adds 30 minutes to the 135 degrees East longitude meridian. Java adds 20 minutes to the time at 105 degrees East longitude. Burma adds 30 minutes to the time at 90 degrees East. Bermuda adds 19 minutes to the time at 60 degrees West. These are the major exceptions, in addition to those previously mentioned. Most nations use the standard meridians.

The general rule for change of date at the International Date Line has been expressed in the rhyme: "Go west, delete; go east, repeat." That is, travelers crossing the line from east to west must drop a day in reckoning, while those crossing the line from west to east repeat the date. — *Lt. I. E. Slutzky.*

## IMPROVED 'PHONE-JACK CIRCUIT FOR THE MOBILE W.E.R.S. TRANSCEIVER

BUILDERS of the WERS mobile rig described by W1FWH in *QST* for December, 1943, may be interested to know that a simple circuit change in the audio mixer stage will permit the headphones to remain constantly in the circuit when loudspeaker reception is not desired.

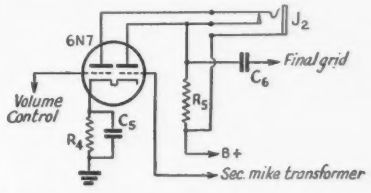



*Fig. 2* — Circuit changes for 'phone jack in the audio mixer stage of the mobile WERS transceiver.

In the original circuit both plates of the 6N7 are tied together. Thus, when the 'phone plug is inserted in the jack both sections of the tube are disconnected from the grid of the amplifier-modulator, preventing modulation. Since one section of the 6N7 is used for receiving and the other for modulation, inserting the jack switch in the receiving section alone leaves the modulator section in the circuit at all times. Fig. 2 shows how this is accomplished. — *Ralph G. Grover, W6KFM.*

## EXTENDING THE USEFULNESS OF A 100-K.C. OSCILLATOR

A 100-kc. e.c.o. secondary frequency standard, such as one of those described in past issues of *QST* and in the ARRL *Handbook*, may be used for calibrating points between the usual 100-kc. intervals if advantage is taken of the fact that its frequency may be varied a few kilocycles either side of the 100-kc. point. If care is used, accurate points every few kilocycles may be obtained in the amateur bands, using b.c. station carriers as reference frequencies.

As an example, one of our local b.c. stations operates on 1320 kc. By increasing the frequency of the e.c.o. so that the thirteenth harmonic falls at 1320 kc. instead of 1300 kc., new harmonics at 3553.846, 3655.385, 3756.924, 3858.461 and 3960 kc. are obtained. Again increasing the frequency of the e.c.o. until the *ninth* harmonic zero beats with a carrier on 930 kc., still more frequencies may be spotted in the 80-meter band, viz., 3513.333, 3616.666, 3720, 3823.333 and 3926.666 kc. In certain cases, the same b.c. carrier may be used as a standard for more than one set of ham-band harmonics. For instance, a carrier at 1270 kc. will permit the calibration of both the twelfth and thirteenth harmonics of the e.c.o. with only a slight change in e.c.o. frequency. Thus two sets of ham-band points may be obtained with the single b.c. carrier as a standard. It is advisable to use only local or clear-channel stations, so that interference will not hamper adjustment to zero beat.

Considerable care must be exercised in making sure of the order of any particular harmonic being used, both in the b.c. band and in the amateur band. To minimize chances of error in the selection of the proper harmonics, it is advisable first to set the e.c.o. standard at 100 kc. by WWV, working from there as a starting point and marking the 100-kc. points on the dial of the ham-band receiver. Any changes in the 100-kc. setting of the standard should be made in very small steps, so that there may be no inadvertent shifting to harmonics above or below the desired one.

As an illustration, let us return to the case previously cited where a b.c. carrier on 930 kc. is used as the standard. The b.c. signal on 930 kc. is first tuned in on the b.c. receiver. Then the e.c.o. secondary standard is set to 100 kc., its ninth harmonic falling at 900 kc. If the frequency of the e.c.o. is now increased slowly until a beat is heard at 930 kc., it may be safely assumed that this is the ninth harmonic.

The harmonics in the amateur band should be watched simultaneously. With the e.c.o. set at 100 kc. the 35th harmonic will be found at 3500 kc., the 36th at 3600 kc., the 37th at 3700 kc., etc. As the frequency of the e.c.o. is increased the frequencies of these harmonics will also increase. When the e.c.o. is set so that a harmonic of known number is at zero beat with a carrier of known frequency, the frequency of the harmonic falling in the amateur band may be obtained by dividing the frequency of the b.c. carrier by the number of the harmonic being used in the b.c. band and then multiplying by the number of the harmonic being used in the amateur band. For instance, in the example given above, the b.c. frequency is 930 kc. and the harmonic used in the b.c. band is the 9th, while those used in the ham band may be the 35th, 36th, 37th, etc. Therefore the frequencies in the amateur band are

$$\frac{930}{9} \times 35, \frac{930}{9} \times 36, \frac{930}{9} \times 37, \text{ etc.}$$

Accuracy will not be materially affected by the use of broadcast-station carriers in the place of WWV for setting the e.c.o., since modern stations rarely approach the limit of the required tolerance of a deviation of 20 cycles from the assigned frequency. The inherent instability of a self-excited standard probably presents more of a limitation on accuracy than does the signal used for calibration.— *Allen Davis, W4CZN.*

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## CONTROL CIRCUITS

A READING of the control-circuit article by "Sourdough" in December *QST* prompted me to offer a description of the system used for several years at W1NV. Although my circuits do not prevent the operator from coming into contact with high voltage, they provide really flexible control of the station and also incorporate some desirable safeguards for the tubes.

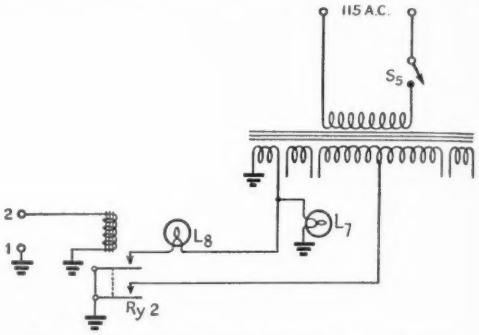


*Fig. 4* — Control circuit for the exciter power supply. $L_7$ is green, $L_8$ red. Terminal connections refer to Fig. 1.

Fig. 3 shows the wiring of the control box at the operating position. $S_4$ is the master switch, the only control which need be operated when the station is on the air. Its manipulation is easy enough to provide a reasonably good push-to-talk system. The switch was originally a four-pole double-throw anti-capacity switch. By judicious bending of the contact springs, it was revamped to operate as shown in the diagram. $S_1$ is a s.p.s.t. toggle switch and $S_2$ and $S_3$ are d.p.s.t. toggle switches.

Transmitter and receiver filaments are warmed up. With $S_4$ down (left-hand position in the diagram) neither will function. By throwing $S_4$ to the center position the receiver high-voltage circuit is closed through the double-pole relay, $Ry_1$. When $S_4$ is up (right-hand position in the diagram) the receiver is dead and the transmitter is on the air. Variously colored pilot lamps indicate what circuits are functioning. $L_1$, white, shows that the receiver is operating. $L_2$, green, indicates that the transmitter power is off, while $L_3$, red, lights only when transmitter is on the air. $L_4$, $L_5$ and $L_6$ are yellow. $L_4$ is lighted when, so far as the control circuits are concerned, the exciter power supply is ready to

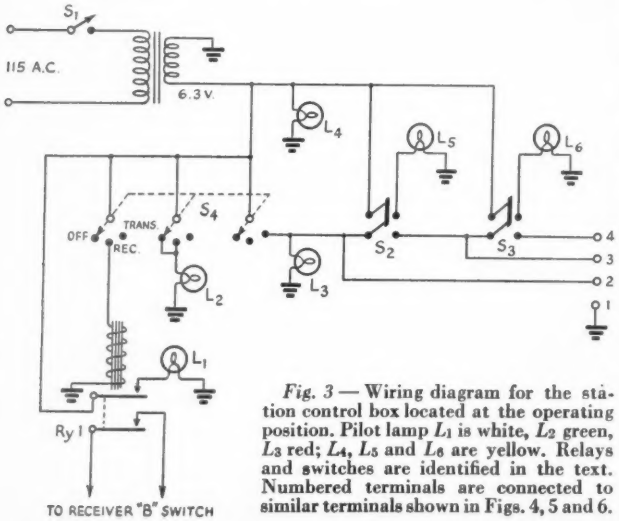


*Fig. 3* — Wiring diagram for the station control box located at the operating position. Pilot lamp $L_1$ is white, $L_2$ green, $L_3$ red; $L_4$, $L_5$ and $L_6$ are yellow. Relays and switches are identified in the text. Numbered terminals are connected to similar terminals shown in Figs. 4, 5 and 6.

go. When $S_2$ is closed $L_5$ is lighted, indicating that the power supply for the buffer and final is ready. When $S_3$ is closed $L_6$ is lighted, showing that the modulator and speech-amplifier power supply will come on when the master switch is closed.

Since it would be undesirable to have the final operating without the exciter, and possibly disastrous to have the modulator on without the final being in operation, the circuit is arranged so that as soon as $S_1$ is closed the exciter control circuit is all set up. Closing $S_2$ simply adds the final-stage control circuit. The modulator control circuit interlocks through the final control circuit. Thus, if $S_3$ is closed while $S_2$ is still open, the relay circuit to the modulator is not completed. Under these conditions $L_6$ lights, warning of the attempt at improper operation of the circuits.

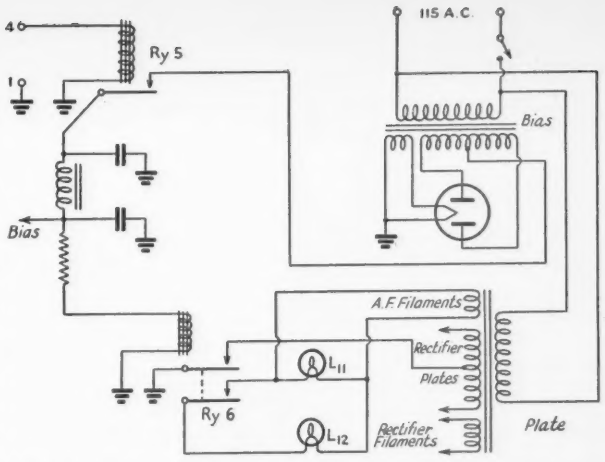


*Fig. 6* — Control circuit applied to power supplies for the modulator and speech amplifier. Lamp $L_{11}$ is green, $L_{12}$ red. Terminals 1 and 4 connect to correspondingly numbered terminals in Fig. 3.

The switching sequence for 'phone operation is as follows: (1) close $S_1$; (2) $S_4$ up; (3) check to see that the exciter is properly adjusted; (4) close $S_2$; (5) adjust the buffer and final stage; (6) close $S_3$, when the entire transmitter will go on the air. From this point on the operation of $S_4$ takes care of the complete station: center to receive, up to transmit. For c.w. operation, simply omit the step of closing $S_3$

The exciter control circuit is shown in Fig. 4. Terminals 1 and 2 correspond with those having the same numbering in Fig. 1. $L_7$ is green and lights when the power-supply line switch, $S_5$, is closed. When $Ry_2$ is energized a red lamp, $L_3$, is lighted, indicating that the supply is in operation. The transformer is designed for combination plate and filament supply, and the high-voltage connection is broken at the center tap.

The power and control circuits for the buffer and final stages are shown in Fig. 5. Closing the line switch, $S_6$, lights a green lamp, $L_9$. When $Ry_3$ is energized a red lamp, $L_{10}$, is lighted and the primary of the Variac is connected to the line.

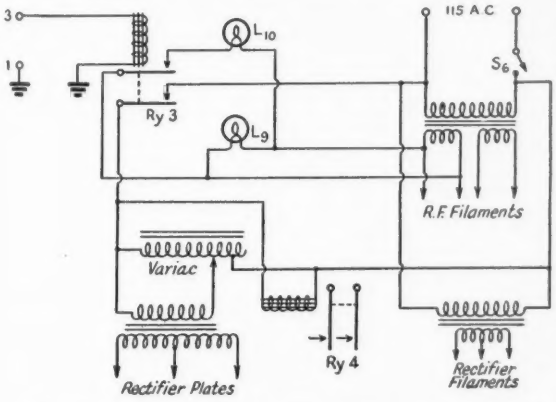


*Fig. 5* — Wiring diagram of power supplies and control circuit for the buffer and final amplifier stages. $L_9$ is a green pilot bulb, $L_{10}$ is red. $Ry_4$ is the antenna change-over relay.

$Ry_4$ is the antenna change-over relay, the coil of which is wound for 115 volts a.c. All other relays are equipped with 6-volt coils.

The modulator connections are shown in Fig. 6. A bias supply is included as well as a plate supply. Since lack of bias would be unhealthy for the modulator, an interlocking control circuit is incorporated to prevent trouble. When $S_7$ is closed all filaments in the speech amplifier modulator and their power supplies are lighted.

When $Ry_5$ is energized the circuit of the bias rectifier is completed, causing bleeder current to flow through the bias filter, bleeder resistor and the coil of $Ry_6$. This actuates $Ry_6$, which completes the circuit of the plate rectifier and applies plate voltage to the audio tubes. Notice that if, for any reason, insufficient current flows through the coil of $Ry_6$ this relay will open, cutting off the plate voltage. The spring tension on $Ry_6$, is adjusted so that nearly full bias voltage is necessary to cause the relay to close. This adjustment provides two-way protection, since in the event of complete bias failure $Ry_6$ will open almost immediately. In fact, the plate voltage is removed so quickly that the modulator plate meter, normally reading one-half to two-thirds scale, will kick up to less than full scale before dropping back to zero when the bias is deliberately removed, as by pulling out the bias rectifier tube.

I avoided the problem of bias failure on the buffer- and final-stage tubes by using high-$\mu$ types — an 809 in the buffer and a pair of TZ40s in the final. I don't believe in pushing tubes very hard. At the moderate plate voltages used, removal of excitation simply reduces the plate currents to a low value with no harm to the tubes.

This system is not fool-proof. Door interlocks and overload relays could easily be incorporated, however, to provide a control-circuit design which should be completely satisfactory. — *Henry D. Hall, W1NV.*

# CORRESPONDENCE FROM MEMBERS

**The Publishers of *QST* assume no responsibility for statements made herein by correspondents.**

## POSTWAR PROSPECTS

Naval Research Laboratory, Anacostia Station, Washington, D. C.

Editor, *QST:*

. . . In view of the increased complexity of the technical phases of modern and future wartime electronic demands, it would be advisable to mold our postwar amateur program to increase the emphasis on the technical and material phases of radio and somewhat deëmphasize the extreme need for code speed. To accomplish this, and in addition to increase the efficiency of our amateur bands, the following proposals are put forth.

1) First and foremost, the ARRL should announce through the medium of *QST* that it favors immediate resumption of amateur activity following the end of the conflict. Undertake tentative negotiations with the FCC prior to the peace, so that "red tape," "probationary periods" and the like will be avoided. I would like to see all station and operator licenses renewed for a period of one year after the end of the war. The effect of such a positive announcement on the morale of the fighting amateurs would be very pronounced. Let the ARRL spend a little less time on WERS and a little more on postwar planning. President George Bailey is now sitting in an ideal spot for such work. The lists of amateurs and their wartime contributions being compiled will, of course, be of great value in accomplishing this program.

2) The present licensing requirements should be changed: The elementary Class B examination should be given to cover operation on 80-meter c.w. and 2½-meter 'phone only, the duration of this license to be one year. At the end of that period an examination resembling our present Class A should be required. The second exam would allow all the privileges of our present Class B license.

3) In view of the trend toward f.m., very-high frequencies, video techniques and multitudinous electronic control systems, a third and increasingly complex examination should be given for the attainment of privileges equal to those of our present Class A license.

4) The band allocations should be changed slightly to increase the required engineering skill of the amateur as a whole. Bands should be set aside in the very-high frequency ranges to allow f.m. and video transmissions. . . .

5) Modify the existing organization of the ARRL so that all the sections are not set up and controlled primarily on a traffic handling basis. Ever since the organization began, the message handlers have held sway. This has been due to the fact that traffic men seem to be the only amateurs with ability to organize into a cohesive unit and to control. May I suggest that we service amateurs can eliminate this hierarchy by sticking together when the war is won? I do not infer that all the ORS boys turn in their badges and become technical wizards, but it would be nice for once to be able to find some candidate for SCM other than a shining light of the BPL.

6) Increase the contests, awards, etc., to make for technical competition and hence increased ability. Why not a certificate of technical proficiency analogous to those already being issued for code speed?

7) The ARRL should maintain a closer check on the requirements of government, industry and scientific organizations, so that future demands upon the amateur may be better anticipated.

8) The younger amateurs of high school and college age should be encouraged toward technical careers by courses and ARRL-sponsored scholarships. This trend has already started with the excellent instructive articles in *QST*.

9) Leave the maximum power limit at one kilowatt. If anything will increase the technical skill of the postwar amateur, it will be competing with the postwar QRM.

10) Dispel the misconception existent among some amateurs that the 'phone and DX men are not carrying their weight in this conflict, and hence should be eliminated from the postwar amateur bands. The technical knowledge gained from 'phone operation and from adjusting beam-antenna arrays for DX has served as the background for many working on our extremely accurate detection devices. Parenthetically, may I remark that, if more people in this world had gone in for DX, perhaps there wouldn't have been a war in the first place.

The ARRL should be congratulated for its efforts toward fitting us for our present duties. When the war is over it is hoped that we can all go back to our first loves — me to my 20-meter 'phone DX; you to your weightless bug, the low end of 40 and a good ragchew; and the rest of us to our various niches. But no matter what we do, let us stick together and strengthen our present ARRL organization for the better enjoyment of our superior hobby and — at the risk of being accused a "flag waver" — the strength and security of the U. S. A.

— *Lt. D. W. Atchley, jr., USNR, W1HKK*

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2426 West Lovers Lane, Dallas 9, Tex.

Editor, *QST*:

. . . Of course, all amateurs know they are from the world's best group of scientific experimenters, but none of us knows exactly whence we

are bound; the condition of our ship is in doubt. However, after reading the November editorial we should feel that we are aboard a ship with a definite destination and realize we have a good skipper on the bridge.

We, the amateurs in general, have taken this matter too lightly, leaving everything to Headquarters. Complacency is as dangerous a thing to the amateur as to our national war effort. Every amateur should start fighting now for the restoration of . . . everything that we, with the help of the ARRL, have spent years to perfect. . . . Nothing is worth having that is not worth fighting for, and let nobody believe that the "special interest" groups won't present a vigorous million-dollar lobby when the battle for the allocation of frequencies begins. Our fighting forces must be ready and equipped for that battle with loins girded with a clout of technical perfection and a shield of discretionary operation. . . .

The amateur has conducted an expensive and what we believe to be a successful research laboratory for the duration of his existence as a ham, contributing a generous amount of skilled labor and at his own expense. We think that the League, with the help of its members, can prove that the amateur has been responsible for most of the important improvements in radio, both before and during the war. We also think our effort as individuals in this conflict will bear the closest scrutiny. We must have something for those of us who come back. We must prevent usurpers of our frequencies from killing the goose that laid the golden egg.

. . . "When amateur radio is criticized in this country as a useless employment of frequencies . . ." we are sure that it comes from those who, for some money-making scheme, want to convert our bands for their personal use. When our frequencies are used for personal conversations we are helping the radio industry by the purchase of equipment which in its small way will help to relieve the unemployment situation after the war. What about our record during times of emergencies? And won't our DX international ragchews help with the "good neighbor" policy? With our personal and real friendships, can't we create more true good will than could any purely propaganda agency? . . .

— *George L. Corley, W5FQY*
*J. L. St. Clair, W5JIH*
*Edward Preston, W5JNO*

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317 Rosemont Blvd., San Gabriel, Calif.
Editor, *QST:*

. . . I wish to say a few words expressing my ideas and also to say FB and congratulations on your forward-looking ideas.

I agree with you on the necessity of many improvements in our housekeeping, and I think we could do with such things as:

1) Segregation of new hams for some training period to the lower-frequency bands.

2) Stiffer examinations for advancement to more interesting bands.

3) A definite development program by the amateurs as a means of obtaining additional privileges of some kind.

There are also a number of things we must not lose — things such as the right to handle third-party traffic. That, today, is paying big dividends in trained operators. Also, we need our one-kilowatt input power limit. . . .

When you are pointing out useful things we amateurs have done, do not overlook the fact that if we had not existed there would have been . . . a great lack of "know how" for the construction of the receivers and transmitters needed by the armed forces. No doubt our radio equipment would have been even more obsolete than Germany's, as the Signal Corps reports.

— *G. Graham MaConomy, W6BUK*

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Co. A, 848th Signal Training Battalion,
Camp Edison, Ft. Monmouth, N. J.
Editor, *QST:*

During my short period of service in the Signal Corps I have discovered that not only is the ham spirit being carried on and harbored carefully by us prewar hams but this same spirit is developing with amazing rapidity among the thousands of Army-trained radio men. We all look forward with anxious eyes to the time when ham radio will again flourish in this turbulent world. Those of us who have operated as hams before derive great pleasure from discussions of the new rigs we'll have when we again hit the air waves from home. The new GI ops, full of questions about license requirements, theory and the cost of rigs, all seem determined to get some pleasure out of the many tedious hours spent cramming code. . . .

Of course, we all feel that our government must see the value of maintaining a communications reserve for postwar security, the basis of which must be amateur radio. The value of amateur radio in the present emergency has been ably demonstrated by the fact that so many signal organizations are built around a few experienced men, mostly former hams, who have had to lend their ability and experience in the training of the many inexperienced men needed to round out such organizations. More than once I've heard officers express their gratitude over having ham-trained operators among their signal personnel. In spite of our seemingly large prewar ham population, we were all too few to meet the needs of present war communications. But thank our lucky stars we were as many as we were!

One other interesting speculation that I find arising in GI ham QSOs (limited to vocal communications, of course) is the possibility that, if and when we get the situation in hand and many of us find ourselves situated for a period in some faraway place, we may be able to slap together a rig and hit the air (after an armistice, of course) from some one of those oft-dreamed-of DX paradises. I believe there is hardly a ham who hasn't at some time wished he could get on the air from that certain DX spot and have all those Ws open up on us, instead of being just one of a gang

of Ws opening up on that lucky DXer. I'm quite sure there is many a W ham situated in some real DX country at present, and there will likely be a lot more of us in the same boat before this thing is over! . . . Did I hear someone say something about the value of ham operation in maintaining troop morale in faraway places, by providing contact with home? Sounds like a bit of propaganda, but it could be an argument!

Now, an end to the dreaming and back to the business on hand, doing our best to serve as communications men for our side in this worldwide struggle. . . .

*— Pfc. Paul M. Cornell, W8EFW*

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Chicago, Ill.

Editor, *QST:*

"It seems to us" that your editorial should never have been placed in print for public consumption. This type of editorial gives interests not friendly to amateur radio the impression that we are a meek, trembling group possessing frequencies which we use as playthings. The best way to convince the opposition that we should have our frequencies returned to us intact after the war is to extoll our good points and accomplishments, to point out that amateur radio is the only means the general public will have to contribute to the advancement of radio and electronics. It is in this direction that we must concentrate our efforts rather than weigh our good points against the bad, especially in print. A more positive and a less defeatist attitude must be taken. We have our faults, but our value to the country in time of distress and war far offsets these faults. Our skeletons in the closet should be left there and not brought out and paraded before the public and the opposition in editorial form.

Let us concentrate our efforts on a program of educating the public to the value of amateur radio, on showing our competitors that they will need men with amateur training to carry on their work, and on showing the world that the amateur bands will be, as they have been in the past, the proving grounds for the advancement of the art as well as the only frequencies assigned for the general public's use. For instance, if the highways were allocated for the use of commercial vehicles only and the general public were shuttled off onto toll roads, they would certainly raise their voices in irate protest. The frequencies assigned for amateur use are in reality the only frequencies in the radio spectrum available for use by the public. We feel that if they were made aware of this fact they would protest the allocation of these frequencies for commercial purposes only.

We have resolved to devote thirty minutes of every meeting to a discussion of constructive ideas for amateur radio. Any definite ideas derived from these discussions will be forwarded to *QST.*

Let's get in there and fight for frequencies, and we do mean fight.

*— L. H. Brown, President,*
*Chicago Suburban Radio Association*

P. O. Box 802, Coeur d'Alene, Idaho

Editor, *QST:*

. . . It would appear as though radio amateurs are to pursue their hobby with an inferiority complex, with the assumption that all other citizens of the United States as well as congressmen are doing us a favor too great to imagine by letting us pursue our hobby.

Aside from all of the benefit the United States and other countries have received from amateur skill, training and development, their usefulness during wartime and times of national disaster, it is my humble opinion that the ether waves that the amateurs use do not belong to any citizen, any group of citizens, any government (including our own), congressman, or president. In that respect it is to be assumed that the right to use a small portion of the radio spectrum does not legally come under the jurisdiction of any government or group of people; therefore, if an amateur fraternity 50,000 strong wish to use part of the radio spectrum for experimental and development work it is not unreasonable to demand the use of that portion of the radio spectrum any more than it would be unreasonable to demand that other hobbies, such as golfing, horse racing, tennis, photography, etc., be licensed, limited, controlled or otherwise interfered with by government. . . .

In consideration of the total benefit which this country has received from the ranks of the radio amateur, it should be considered unpatriotic, selfish, inconsiderate and unfair for our government "of the people" to do anything but praise and assist the amateur fraternity in every way possible rather than expect the amateur to fight for existence.

As a citizen of these United States, and as a member of ARRL, I am inclined to be belligerent to any thought of begging for the rights and privileges of amateur radio.

. . . I would suggest that amateur radio clubs and other persons interested in the welfare of a continued amateur radio hobby should inaugurate a nation-wide program at the close of the present war to inform the general public of the value of the radio amateur during this war and in times of peace. This nation-wide program could be made possible by newspaper articles in which notable achievements by amateur radio personnel would be related, as well as publicizing the amateur war service record in all large communities. . . .

*— Jack R. Zeckman, W7DVK*

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Lakeview, Oregon

Editor, *QST:*

In his editorial in the current issue of *QST,* K.B.W. invites discussion of the postwar status of amateur radio. I hope he means it, and also that the discussions may include opinions that differ widely from those of the inner-circle members of the staff of *QST.*

In my judgment the most important single . . . need in the reëstablishment of amateur radio

on a solid, sound and respectable basis is a reversal of the editorial attitude of *QST*.

Devoted as I am to this fine hobby and its perpetuation, I am frequently driven from disgust to despair by the continuous pounding by K.B.W. on the thesis that the amateur has no right to exist — that he is here merely as a temporary windfall of Fortune, or by the grace of God.

I lay no claim to being a psychologist, but it is perfectly apparent and unmistakable to me that the surest way to convince the public of our uselessness is to keep admitting it. As I stated once before (in a communication which was ignored) there is not the slightest question in my mind that we have a perfectly established and permanent right to the amateur frequencies. . . . In the vernacular of the plains: "We homesteaded the bands, set up our dwelling, made our improvements, and were finally granted a title."

As I see it, the amateur bands are a playground, workshop or educational institution of the air, set up by and maintained by the government (at very little expense), whose facilities are available to any citizen who cares to meet the entrance requirements. Exactly on a par with a National Park, for instance, which is established and kept up permanently for the pleasure and *not the profit* of those who may care to enjoy it. . . .

As for our conduct, both present and future, let us first of all hold up our heads, stick out our chests and *believe* in ourselves.

— *Bill Bach, W7FHX*

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42 Bonair St., West Roxbury, Mass.

Editor, *QST:*

. . . You state in your editorial that "we need a bright shield . . . to have something to hold up before the world that will commend amateur radio to various groups," etc. It would seem to me that radio amateurs are already possessed of such a shield and have emblazoned upon it many emblems of heroic self-sacrifice and devotion to our fellow men.

Prior to World War II, not a major disaster has occurred without some form of participation by amateurs in the unstinting and unselfish work of communications which would tend to lessen the travail of the unfortunate. Surely the record radio amateurs have compiled in the present conflict would seem to be a "shield" of sufficient brilliancy and covered with deeds of heroism that all might see. In other words, I gather that the gist of your editorial was to ask radio amateurs to further present their case for existence, or justification, if you will. Surely from our work in the past and present, and potential work in the future, we have already justified our existence.

You speak of what they have done in foreign countries regarding amateur radio, particularly in England. Why should we be guided as to what is done in England, or in any other foreign country for that matter, regarding the status of this art? True, the qualifications in the United States may not be as rigid as they are elsewhere. You say further "we find it difficult to determine whether this is a weakness or a source of great strength." This country was founded upon a spirit of independence. While it is true that some of our fundamentals had stemmed from foreign countries, we have ever increasingly become divorced from foreign institutions and what they stand for. That to my mind is as it should be.

You stress that the amateur should possibly become more or less of a technician. As you say, there are many who engage in the practice simply for personal pleasure. On the other hand, when a man is given a license to drive a pleasure automobile there is no stipulation that he at once tinker around it and become a full-fledged mechanic. Nor is there any stipulation, when the federal government licenses a motor boat, that a man then begin to prepare himself as an officer in the merchant marine, or that he should further his studies of navigation.

Undoubtedly, we shall have a job on our hands to preserve our present frequencies. Unquestionably, as you say, the postwar period will be marked by greed and will be subjected to the ever-tightening tentacles of big business.

We amateurs look to ARRL in this matter of preservation of amateur rights. I feel that the amateur has justified his existence and I feel that this is a splendid opportunity for ARRL to justify its existence, by exerting every possible influence upon those who find it within their power to make a decision regarding our future. . . .

— *William F. Mahoney, W1NOV*

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Warrenton, N. C.

Editor, *QST:*

. . . What you have to say is apt and timely. I also feel we have now reached a point in the military situation where postwar activities can safely be considered.

With the exception of two or three years, I have been actively operating an amateur station for almost twenty years. During this period I have been a member of ARRL for possibly fifteen years, and have followed the course of the League very closely.

Many times I have wondered if the League has demonstrated its full power and authority in handling amateur matters. I know it speaks for the amateur and speaks well. It is the most valuable force in amateur radio, but I want it to speak louder and speak gruffly when necessary.

In plain words, I feel the League should adopt an attitude more of demand than of supplication. We have the organization and we should make ourselves felt. Let's get away from this hat-in-hand approach to government and big business. It has not availed us one thing that I can see. On the other hand, we were squeezed a little tighter in 1928 and will probably face another squeeze play after the war. For a long time I have felt that our habit of accepting the leavings from the conference tables should be stopped. It is my belief that the practicing American amateur has a citizen's right to a part of the radio spectrum;

exactly the same right he has to fly his aircraft through the air or to fish and operate his cruiser in the public waters.

This brings me back to your editorial and especially that part in which you state: "We owe it to ourselves to state our principles in terms that far transcend the transitory individual pleasures of pursuing a hobby." Quite true, in some respects, but the transitory individual pleasures are important. They are ninety per cent of amateur radio and a right within themselves, and I am willing to put up a fight for them.

In closing, you state that the first phase of the fight will be to reactivate the amateur stations. There is no disagreement on that, so let's get on with the job. First of all, and to this end, may I suggest a new department in *QST* — a monthly column devoted to all activities and all developments incidental to accomplishing the first phase. It is up to the League to keep the membership fully informed of what is going on in amateur politics. For some reason this has not been done in the past, and it has not helped the League or the membership. We will have a tighter organization and will not have members writing FCC or other officials on their own initiative, which signifies a loose organization and consequent weakness. . . .

I feel the League should begin at once the consideration of such matters as what goals should amateurs set for maximum postwar operating effectiveness. Will we have to hire extra counsel and lobbyists, and are funds available for this? If the war ends in Europe and a long war appears certain in the far-off Pacific, should we begin agitation for limited operating privileges?

Someone said during the French Revolution that many crimes were committed in the name of liberty. Our government has committed many blunders in the name of "military secrecy" and "harmful to the war effort." No amateur wants the war effort harmed in any way, but he does want to be alert and quickly ask for the return of his privileges when conditions warrant.

— *H. W. Holt, W4TP*

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117 N. Roberts Blvd., Dayton 2, Ohio

Editor, *QST:*

In the latest issue of *QST* I read your editorial about how we, the amateurs, will undoubtedly have to put up a good fight to retain the frequencies that we had before the war. To anyone who would deny us those privileges, I would like to put this question: What group of unpaid individuals in the pursuit of advancing the art in which they were interested has done more to bring the art up to its present status than has the radio amateur?

Nearly every one of the improvements that we know today has come from the shack of some amateur in a city, town or village somewhere. Our record in war, in peace and in emergencies should speak loudly enough.

— *Cpl. Irvin K. Ebel, W9GTD*

712 Highland Ave., Barrington, Ill.

Editor, *QST:*

While winning the war is still, and rightly so, the chief concern of everyone, the winning of a lasting peace will be an even greater problem to our country. Let's show 'em what amateur radio can do to help.

Even as we credit the winning of the war due in part to radio developed by engineers, radiomen and amateurs, so can we work to ensure a lasting peace. We, the Allies, are winning because we keep at least one step ahead of our enemy nations, and this is greatly due to our inventive genius and skill. In maintaining this standard, amateur radio has played an important part. Surely it is to our vital interest as amateurs in safeguarding our nation against future aggression to keep this one step ahead in radio. . . .

In consideration, then, of the amateur's postwar status and using the foregoing as a basis, may I suggest the following:

1) Advertise by radio and press, if possible, what amateur radio has done in war and in prewar days for the benefit of our country, and that returning the amateur to the air will greatly stimulate further development of radio. It should be stressed also that amateurs, aside from discussing radio problems over the air, are essentially radio experimenters for the good of radio.

2) Every amateur in the postwar period should be required to engage in experimental work. In England this is required of the amateurs and everyone knows what radio has done for England during the air blitz — prevented, perhaps, the losing of the war.

Let it be urged strongly that every radio amateur keep up a rigorous experimental study for the good of radio. In short, our return to the bands, if permitted, should mean our solemn pledge to perform an even greater active service for our country than ever before.

— *L. D. Smith, W9IFY*

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Class 44B, Sqd. 21, Bks. 553,
Prov. A/C Detach., Minter Field, Calif.

Editor, *QST:*

. . . For the war effort, of course, prior training of operators has been of paramount importance, but it won't serve as a reason for the future.

I surely can't see the British system of requiring all experimentation, although a modification of their idea might be in order. For instance, I think it might be a good idea to set aside a portion (less than half, though) of each band for experimentation only (ragchewers being ruled out in this portion).

One thing that's going to be a hard problem is that of restoration of hams to the air at the close of the war. They may try to activate a few frequencies and/or bands and then fail to let any more out. This must be guarded against at all costs, although I realize the Army's use of some frequencies for a while might prohibit their use by us. . . .

— *A/C London K. Allbright, W6SLF*

### THE VALUE OF HAM TRAINING

805 T.S.S., Bks. 1027, AAFTS, Sioux Falls, S. D.
Editor, *QST:*

Since coming to the Air Forces' radio school as a student, I have learned the real value of my previous ham experience. Thanks to my previous knowledge of code, I can copy 35 w.p.m. on the mill and hope to be doing better by the time I graduate. And the constructing and operating is proving its worth in theory class.

There is a lot to be learned here. The equipment is quite different from the breadboard rigs we used to take pride in, but every new trick is just that much easier to the hams. . . .

Now a good word for *QST*. Several months ago I was in the station hospital for some time. I have appreciated *QST* ever since I began subscribing in '39, but never so much as when I received a copy in the hospital. Before I put it down I had read every article and every advertisement, from cover to cover. You at ARRL Hq are doing a great job in strenuous times. It's awfully hard to make a magazine that's devoted entirely to amateur radio interesting when ham radio as we knew it has been curtailed. But you are doing a swell job — one of which we are proud. Keep up the good work!

*— Pfc. John E. Cann, W8IEM*

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### "HELLO" FROM ALASKA

Somewhere in Alaska
Editor, *QST:*

Having read several of the letters in Correspondence from Members, I thought I would drop you a few lines to say hello from this end.

I have met quite a few of the boys, and we have a big roundtable all planned when this mess is done up.

Because of censorship it is difficult to say much — but take it from me, pounding brass for the Air Corps keeps one's fist in very good shape for the day when we receive the green light. . . .

Thanks for the splendid job you are doing. Keep up the good work and we can't miss.

*— T/Sgt. Ervin A. Hurley, W9MKM*

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### EXPRESSING HIS THANKS

APO 302, c/o Postmaster, New York, N. Y.
Editor, *QST:*

I have been a member of ARRL since 1936 and yet have written not one letter expressing my thanks for all you have done and are doing for us hams. I read with interest the entire issue of *QST* each month and . . . think the staff is doing a marvelous job in publishing such an interesting magazine during wartime, when most of us are in government service in some capacity. The articles on WERS must be extremely helpful to those engaged in that work. . . .

Keep up the good work, so that when this fracas is over we can once again hear that old familiar CQ.

*— Pvt. U. W. Pickens, jr., W5IIG*

### HAMS IN THE WAR

U. S. Naval Air Station, Corpus Christi, Tex.
Editor, *QST:*

I have read with interest the tales of hams in the war and herewith set down a few items.

My brother, W7GVC, was a radio operator in the infantry in Australia and later in New Guinea for seven months. He made numerous beach landings and was in several battles, including the Battle of the Solomons. In fact, when he received his orders for flight training he had to walk for two days to reach the coast. From what he has told me, the life of the infantry radioman must be the toughest of all. His general opinion of Japanese equipment was that it is simple and fairly efficient.

As for myself, I was recently transferred here from a bombing squadron in the Pacific fleet. . . .

The hams in this war are doing an all around FB job. I have found them everywhere — from the smallest island in the Aleutians to the largest Naval base in the States.

A strange coincidence was that, after being stationed here at Corpus Christi, Tex., my brother was stationed at Sheppard Field, Tex., where he is now a cadet. He recently came to Corpus Christi and we saw each other for the first time in two years. [See photograph on page 21 of this issue. — EDITOR.]

We both are thankful for *QST* and cheerfully admit that it helped out when the going was tough and some recreation was needed.

*— D. E. Stewart, ARM1c, W9IYH–ex-7HBO*

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### HAM HOSPITALITY

60 Searells Rd., Papanui, Christchurch, N. Z.
Editor, *QST:*

All hams, no doubt, were interested in W5IXT's letter in the July, 1943, issue of *QST*, p. 59, wherein he wrote of the hospitality extended to him by the ZL hams during his visit to Christchurch, N. Z. Since Chet visited us there, fate has been playing tricks with me and it has been my great pleasure to share with several W hams the hospitality of the VKs. Ham hospitality in Australia knows no bounds and one has to be quite robust to be able to keep up with dates, etc.

Since my arrival from New Zealand I have met many W hams — all very FB fellows, believe me. One evening ZL3CD, who is with me here in Australia, and I sat at a table in a café. We had not been there long when an American Navy lad sat down at our table. We recognized him as a sparks by his sleeve insignia and began talking with him. One of us said: "Did you do any radio work before the war?" He replied: "Oh, yes!" I said: "You weren't a ham by any chance?" Imagine our delight when he answered: "Yes, I am W8JQE."

There we were — two ZLs and a W in a VK café! I think we talked more and ate less in a given time than we ever had before. Unfortunately, Paul was due to go back into the war zone almost

(*Continued on page 86*)

# OPERATING NEWS

**GEORGE HART,** WINJM
Acting Communicating Manager

**CAROL A. KEATING,** W9WWP
Assistant Communicating Manager

*Re* **Batteries.** A number of radio aides have written to ask: "Where are the batteries you talked about in *QST*? We haven't seen any of them." Well, *we* have, and we can tell you that any rumors that the batteries will not be available after all are completely without foundation. But there are formalities to be observed, of course. If you are a radio aide who wants his quota of the batteries, you should camp on the doorstep of your state radio aide or state communications officer until he orders, through the state property officer, his state's quota of the batteries from the Equipment Section of OCD. Complete details on how to order were given in our bulletin of October 5th, a copy of which was sent to each radio aide.

These batteries are unused, but were manufactured between a year and a year and one-half ago. About 5 per cent of them test slightly under full strength, but the rest seem to be in top-notch condition. They are of all shapes and sizes, and voltages from a single battery range from the smallest 1½-volt cell to 162-volt "B" batteries. They are, for the most part, not of standard sizes and voltages, and in general will not be suitable for use as simple replacements for batteries which have gone dead in walkie-talkies and handie-talkies without some modification of the within-the-cabinet space allocation.

Some types are more plentiful than others. When ordering, consideration should be given both to the size and adaptability of each battery to each application and to the supply of the desired type available. A complete list of battery type numbers, sizes and voltages was given in the October 5th bulletin, along with the number of batteries of each type available to each state.

Surely these batteries can be put to good use by our nation's WERS systems. Awaken that old amateur ingenuity, look over the list, order the types which are most numerous, if possible, and find ways to adapt them to your system.

Here is a short list of the sizes and output voltages of the most numerous batteries:

| *Size* | *Voltages* |
|---|---|
| 3½ × 2 × 2½ inches (Useful for battery power supplies.) | 22½ |
| 6½ × 4 × 3 inches (Heavy duty "B" supply in cars or fixed units.) | 22½ |
| 11½ × 1⅝ × 1⅝ inches (Long and flat, these can be used where there is only an inch or two of space available along the side of a cabinet.) | 103½ |
| 5 × 7¾ × 7½ inches (Endless possibilities.) | 3, 4.5, 13.5, 144 |
| 10 × 5 × 2¼ inches (Four of these in series will supply both plate and filament power for a small unit.) | 1½, 90 |
| 2½ × 2⅜ × ¾ inches (Microphone voltage, bias, portable filament supply.) | 4½ |
| 2½ × 2¾ × ¾ inches (Similar to above, but slightly larger.) | 4½ |
| 6¾ inches long × 1¾ inches diameter (The familiar heavy-duty 1½-volt cell, extensively used for emergency filament supply.) | 1½ |
| 6¼ inches long × 1¼ inches diameter (Another husky 1½-volt cell.) | 1½ |
| 4 × 2¾ × 1⅝ inches (Compact small cells; four in series wrapped in tape make an excellent low-drain filament supply.) | 1½ |

There are 26 types in all, including some batteries very easily adaptable to WERS such as 135, 90, 67½ and 45-volt "B" batteries of all shapes and sizes, a number of other 4½- and 1½-volt types, and several types which have four or more different output voltages. Included are the familiar "Minimax" batteries used in DK-3 transceivers, but the supply of these is very limited.

Does this list make your mouth water? Then get after your radio aide to get after the state radio aide or communications officer to get after the state property officer to order your state's quota. Remember that there must be a place for storage, presumably on state property, and a means for insuring careful and fair distribution; but these are details it should be possible to arrange. The important point is that these batteries have been made available to WERS and WERS should use them. They are not doing anybody any good lying in storage, and they won't last forever.

**OCD Manual** The national Office of Civilian Defense has published a manual for WERS which

## *Honor Roll*

***The American Radio Relay League War Training Program***

**Listing in this column depends on an initial report of the scope of training plans plus submission of reports each mid-month stating progress of the group and the continuance of code and/or theory classes. All Radio Clubs engaged in a program of war radio training are eligible for the Honor Roll. Those groups listed with an asterisk teach both code and theory. Others conduct only code classes.**

***Burlington (Vt.) Amateur Radio Club**
***Chelan (Wash.) High School**
**RY Post of the American Legion, St. Paul, Minn.**
***South Jersey Radio Assn., Merchantville, N. J.**
**Tucson (Ariz.) Short Wave Association**
***Walnut Hills High School Radio Club, Cincinnati, Ohio**

should help to answer a long-standing demand for some sort of written guide to WERS organization and operation. The manual is paper self-covered, some 40 pages in length, printed in good-sized type making for easy reading, and contains chapters on general considerations, organization and administration, personnel and training, equipment, and operations. There are three appendices which contain respectively the CD-WERS rules and regulations, typical questions and answers on basic law governing radio operators (Element 1), and a list of FCC field offices. The manual is well illustrated by diagrams showing network and administrative organization.

Everyone interested in WERS should have a copy of this publication, for it states very clearly the objectives of WERS organization and outlines the general steps to be taken in accomplishing these objectives. If your organization is still in the contemplative stages, it will help you to formulate your plans in accordance with recommended OCD practices. If you are in the process of organizing, it will assist in conforming your organizational procedure to standards set down by OCD. If you are already licensed and in operation, it may give you some valuable suggestions for further improvement of your system.

**ARRL Manual.** At this writing ARRL's WERS Manual is in the printer's hands, and it should be in distribution by the time this appears. This manual was written on the basis of long and intimate experience with WERS problems and aims at discussing in the minutest detail the irritating problems which our correspondence and personal experience have indicated are the greatest drawbacks to WERS organization. It is typical of all ARRL publications in that it not only tells what to do but how to do it, on the basis of how it *can* be done and how it *has* been done. We'll be glad to send a copy to any ARRL member participating in WERS, without charge. To others we make a nominal charge of 10 cents to help cover printing and shipping costs.

***A Manual for the War Emergency Radio Service***

**Yes, it's ready — the new ARRL WERS Manual. (See the adjoining announcement and "It Seems to Us" in this issue). The real, practical low-down on WERS organization, administration, procedure, drills. Free to ARRL members; 10¢ a copy to others.**

**Continue WERS Activity.** On the editorial page of this issue will be found a plea to all amateurs that WERS activity be continued without letup despite the apparent changing military situation. We urge that you all read it to absorb some convincing reasons why it is in the best interests of both the nation and us amateurs to keep the WERS channels occupied.

**WERS of the Month.** Two months ago, in this department, we announced a new feature, "WERS of the Month," in which we invited radio aides and WERS participants to brag about their systems in print — or words to that effect. To say that the response has been discouraging would be a gross understatement. The response has been *nil*. In order to introduce the feature, however, we prepared a story on Syracuse WERS for the January issue, with the permission of the Syracuse radio aide. This month we shall have to repeat that procedure, for there have been no voluntary contributions.

Well, we thought it was a pretty good idea and that you fellows would be glad of an opportunity to show, in writing, that your organization was alive and active. If it is impossible to produce an article on the entire system, how about write-ups on your radio aides or other prominent members of your organization who are amateurs? We want to make "WERS of the Month" the outlet for all of you want to tell the world about your WERS organization. What say? Can do?

— *G. H.*


*Left* — At the control station for the Syracuse (N. Y.) WERS network — WKBS. From left to right: Ken Thomas, secretary of Syracuse WERS and editor of the *WKBS Bulletin;* Kenneth S. Upson, special representative of Syracuse WERS; J. Clarke White, W8BAL, chief net operator; Jerome Blaisdell, W8STD, radio aide of WKBS. *Right* — Sixty per cent of the total licensed units of WKBS are mobile. One of these mobile units is shown here, with Henry G. Parr recording in the log and Keith Rhodes operating the transmitter controls. This particular unit was an automobile b.c. receiver rebuilt for WERS purposes by Charles R. Hart, W8NXQ.

# WERS of the Month

## Fall River, Mass.

THE first anniversary of WJSU — the Fall River, Mass., WERS unit — was celebrated November 3, 1943. For one year this WERS organization had been serving in civilian defense in Region 8 of Massachusetts, and it was felt fitting to recognize and celebrate the event in view of the past obstacles which had been overcome before the unit reached its present efficient peak.

Strangely enough, it was not the equipment which seemed to present the greatest problem but rather the matter of operating procedure. The streamlining of handling messages for dispatch, setting up of priorities for messages and speedier handling of them became the objective of the arduous drill sessions which were found to be the solution to the difficulty. In addition to the drills, two hours of weekly classroom instruction were given to the operators, at which CD problems in communications and net operation were were discussed and procedure was taught.

In the beginning, code and theory were also taught as part of the operator-training program, but as the class dwindled in size, and the WERS rules were announced, code and theory instruction was discontinued and the emphasis was placed on basic radio law (Element 1). Approximately 78 WERS permits were received as a result of the training. This represented a nice supplement to the group of 18 amateurs which formed the "ham nucleus" of the organization.

A strictly disciplined operating procedure has been constantly maintained, and the high-spot of activity for the units occurs on the weekly Sunday night drills. Early in the history of WJSU, certain rules were enforced. These rules required basic drill attendance, rotation of all operators through the NCS position so that all would be adequately trained to control the net if it should become necessary, and regular attendance thereafter, so that the organization would not become simply a "paper" one in any sense. In several instances, non-compliant operators have been asked to turn in their permits for cancellation by the FCC.

The radio aide has nothing but praise for his women operators, who comprise fully 50 per cent of the operating personnel. In addition, he says that they do a slightly more efficient job of operating than even the licensed amateurs because "they have never been spoiled in unrestricted ham operation and they adhere to orders and pass along the intelligence necessary in the fewest number of words."

An interesting feature of WJSU's operation is that a deputy chief warden has been assigned as liaison agent to the rest of the CD services. He evaluates all messages, plans the drills, and otherwise is responsible for all messages and forms used via radio. From time to time an outsider from the Army, the OCD, or the Massachusetts Committee on Public Safety is asked to observe the operation to find flaws.

WJSU consists of 29 active units, most of which are installed in fire stations. Of the 29 units, 22 are fixed and the others are of the portable and semi-portable type. The list includes Abbott TR-4s (majority), MRT-3s, DK-3s and several composite types. The fire stations are the headquarters of CD in the 10 districts of Fall River, and each of these places is equipped with WERS units. In addition, there are 4 local hospitals — the medical headquarters for the various CD medical services — and each of these hospitals has been equipped with a unit. The control unit is located in a building adjoining the d.w.c., which has a unit to maintain contact with the control. Liaison is maintained by telephone and radio circuits. A key broadcasting station is monitored during drills to "double-check" on any alerts that might be received.

Radio Aide Horatio A. Gray has a right to be proud of his organization and personnel, whom he describes as a "loyal bunch, doing a swell job, as enthusiastic as any other CD unit in the city. Their loyalty and attendance at drills is something to marvel at." We have an idea that, were it not for the "spark-plugging" of this modest radio aide, this group could not have become the efficient organization it is.

## ELECTION NOTICES

*To all ARRL Members residing in the Sections listed below:*

The list gives the Sections, closing date for receipt of nominating petitions for Section Manager, the name of the present incumbent and the date of expiration of his term of office. This notice supersedes previous notices.

In cases where no valid nominating petitions have been received from ARRL members residing in the different Sections in response to our previous notices, the closing dates for receipt of nominating petitions are set ahead to the dates given herewith. In the absence of nominating petitions from Members of a Section, the incumbent continues to hold his official position and carry on the work of the Section subject, of course, to the filing of proper nominating petitions and the holding of an election by ballot or as may be necessary. Petitions must be in West Hartford on or before noon of the dates specified.

Due to resignations in the Missouri, Eastern Florida, San Joaquin Valley and Colorado Sections, nominating petitions are hereby solicited for the office of Section Communications Manager in these Sections, and the closing date for receipt of nominations at ARRL Headquarters is herewith specified as noon, Tuesday, February 15, 1944.

| *Section* | *Closing Date* | *Present SCM* | *Present Term of Office Ends* |
|---|---|---|---|
| Missouri | Feb. 15, 1944 | Robert C. Morwood (resigned) | ..... |
| Eastern Fla. | Feb. 15, 1944 | Carl G. Schaal (resigned) | ..... |
| San Joaquin Valley | Feb. 15, 1944 | Antone J. Silva (resigned) | ..... |
| Colorado | Feb. 15, 1944 | Stephen L. Fitzpatrick (resigned) | ..... |
| Hawaii | Feb. 15, 1944 | Francis T. Blatt | Feb. 28, 1941 |
| Sacramento Valley | Feb. 15, 1944 | Vincent N. Feldhausen | June 15, 1941 |
| Nevada | Feb. 15, 1944 | Edward W. Heim | Nov. 1, 1941 |
| Oklahoma | Feb. 15, 1944 | R. W. Battern | Nov. 1, 1941 |
| Alaska | Feb. 15, 1944 | James G. Sherry | June 14, 1942 |
| Southern Minn. | Feb. 15, 1944 | Millard L. Bender | Aug. 22, 1942 |
| New Hampshire | Feb. 15, 1944 | Mrs. Dorothy W. Evans | Sept. 1, 1942 |
| West Indies | Feb. 15, 1944 | Mario de la Torre | Dec. 16, 1942 |
| Maine | Feb. 15, 1944 | Ames R. Millett | June 7, 1943 |
| South Carolina | Feb. 15, 1944 | Ted Ferguson | Aug. 25, 1943 |
| Western Fla. | Feb. 15, 1944 | Oscar Cederstrom | Oct. 1, 1943 |
| West Virginia | Feb. 15, 1944 | Kenneth M. Zinn | Nov. 21, 1943 |
| Eastern Mass. | March 15, 1944 | Frank L. Baker, jr. | April 2, 1944 |
| San Diego | April 3, 1944 | Richard Shanks | April 15, 1944 |
| Idaho | April 3, 1944 | Don D. Oberbillig | April 15, 1944 |

1. You are hereby notified that an election for an ARRL Section Communications Manager for the next two-year term of office is about to be held in each of these Sections in accordance with the provisions of the By-Laws.

2. The elections will take place in the different Sections immediately after the closing date for receipt of nominating petitions as given opposite the different Sections. The Ballots mailed from Headquarters will list in alphabetical sequence the names of all eligible candidates nominated for the position by ARRL members residing in the Sections concerned. Ballots will be mailed to members as of the closing dates specified above, for receipt of nominating petitions.

3. Nominating petitions from the Sections named are hereby solicited. Five or more ARRL members residing in any Section have the privilege of nominating any member of the League as candidate for Section Manager. The following form for nomination is suggested:

(Place and date)

Communications Manager, ARRL
38 La Salle Road, West Hartford, Conn.

We, the undersigned members of the ARRL residing in the.....Section of the.....Division hereby nominate.....as candidate for Section Communications Manager for this Section for the next two-year term of office.

(Five or more signatures of ARRL members are required.)

The candidates and five or more signers *must* be League members in good standing or the petition will be thrown out as invalid. *Each candidate must have been a licensed amateur operator for at least two years and similarly, a member of the League for at least one continuous year, immediately prior to his nomination or the petition will likewise be invalidated.* The complete name, address, and station call of the candidate should be included. All such petitions must be filed at the headquarters office of the League in West Hartford, Conn., by noon of the closing date given for receipt of nominating petitions. There is no limit to the number of petitions that may be filed, but no member shall sign more than one.

4. Members are urged to take initiative immediately, filing petitions for the officials of each Section listed above. This is your opportunity to put the man of your choice in office to carry on the work of the organization in your Section.

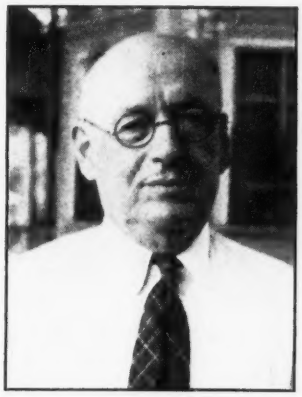
— *George Hart, Acting Communications Manager*

## ELECTION RESULTS

Valid petitions nominating a single candidate as Section Manager were filed in a number of Sections, as provided in our Constitution and By-Laws, electing the following officials, the term of office starting on the date given.

| | | |
|---|---|---|
| Md.-Del.-D. C. | Hermann E. Hobbs, W3CIZ | Dec. 1, 1943 |
| Connecticut | Edmund R. Fraser, W1KQY | Dec. 13, 1943 |
| San Francisco | William A. Ladley, W6RBQ | Dec. 15, 1943 |

# Meet the SCMS



**W3CIZ**

"Waiting for a street-car," or rather, for a railroad train, was originally responsible for creating an interest in radio on the part of Hermann E. Hobbs, W3CIZ, SCM for the Maryland-Delaware-District of Columbia division since 1939. Attracted by the telegraph-sounder noises which he heard emanating from the railroad station, he immediately "inquired within" and obtained a copy of the Morse alphabet from the young woman operator. Thus fortified he rigged up a beginner's telegraph set with batteries, and subsequently interested the neighborhood boys to such an extent that they formed a "line" covering several miles with more than a dozen stations and operators. All of this was in the days before radio existed, but the telephone was just coming into use and the boys soon added several telephone sets to the neighborhood line.

W3CIZ soon turned this experience to good use. He went to work for the railroad as a reliefman, finally winding up in the dispatcher's office. From there he went into commercial work for Western Union and Postal Telegraph. About that time the Spanish-American war began and he enlisted in the Maine National Guard Signal Corps unit. The unit was sent first to Washington, then to Port Tampa, and finally to Siboney, where it relieved a regular Army Signal Corps detachment and took over telephone, telegraph and cable operations.

After returning to the States and working for a time as foreman and electrician, Hobbs was notified that he had passed the Civil Service examination for the post of weather observer with the U. S. Weather Bureau. This was also his hobby, and the work so interested him that he is to this day employed at the Washington (D. C.) central office in charge of the testing and calibration of various meteorological instruments.

W3CIZ began his amateur radio career about 1930, after he had been induced by a ham friend to construct a transmitter and apply for an amateur license. He became interested in traffic handling, and joined the AARS and the "Hit and Bounce" traffic net. He was made SNCS for the State of Maryland, and in December of 1939 took over the SCM duties for his section. Proof of his popularity is the fact that he has just been reëlected to a third term in the office.

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**BRIEF**

A *radio engineer* [as defined by a Signal Corps inspector] is a person who passes as an exacting expert on the basis of being able to turn out with prolific fortitude infinite series of incomprehensible formulas calculated with micrometric precision from vague assumptions based on debatable figures taken from inconclusive experiments carried out with instruments of problematical accuracy by persons of dubious reliability and questionable mentality for the avowed purpose of annoying and confounding a hopelessly chimerical group of esoteric fanatics referred to all too frequently as *practical radio men.*

*— FM Radio-Electronics*

# 20-Year Club

Here is the roster of amateurs who have held amateur operator or station licenses for twenty or more years, and who are still licensed amateurs. If you can qualify for this roster send along a brief chronology of your ham career, giving the date you started in amateur radio, the call and date on your first amateur license, and all other calls you have held through the years up to the present time. If eligible, your call will be published in the next list of 20-Year Club members.

**W1**AHY AJ AR BB BDI BNL BPN BSJ BXC CJA DMF DMP EAO EH ES FA FJE FMP FMV GDY GS HGX HXQ JFN LZ MD MLT NF PG RP UP WR **W2**ADW AOS AX BO BR BYW CJX DI DIH DYT DZA EC ELN EMV GVU GVZ HCO HTU IMF IP IW IZ JF JRG MIL PF PL **W3**ACX AVJ BO BYR BZ CA DRO EUY FLH GJ GLH GPA GQL HQW HWO JL KT QJ RR WS ZI **W4**BZ CNZ DIN WD/5FSI **W5**AQD CVQ EOW ERJ NT **W6**AM AVC CFN/CVC EA EY GM GS IT IWU IX KMA KTQ LM MMB MSN NPD OCH OJY OVK PKX QKI QOJ VU **W7**AZX BG COH DVY EMT GCO QP **W8**AL APD AQ AYS BWP CHU CMH CNX DOX FRY GYR IGT IIO JDV KHM ND OA OXH QAN RN SDR SIX SQE SQW TGX UGR ZS ZY **W9**AA AB CA CDE CS CSZ CVU CX DAX DGM DHM EL ESA EVG EW FRC GTR NZZ OSQ RRC RWF VFW VKF VS VV WIN WTE WZE YNQ **K4**KD **K6**ONM **K6**QYI **VE3**RB **VE5**GA.

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**BRIEFS**

Reminiscent of the good old days was the first Eimac hamfest held at Eitel-McCullough's San Bruno, Calif., plant in November, 1943. The 41 hams in attendance proved they were no amateurs when it came to eating — 35 small fryers and 20 pounds of beef were consumed in short order. Guest speakers were Orin H. Brown, W6HB; Royal Higgins, W9AIO, Eimac's Chicago field representative; Bill Stancil, W6CGB, of Motorola; Brower McMurphy, radio aide of the Alameda County sheriff's office and the Signal Corps, and Lt. Hiewinkle, **W7HTX**, of the Signal Corps. Lt. Hiewinkle showed two fine pilot safety training films.

Those who attended were: **W6**TGH, WN, LV, BCZ, EHW, UF, AAZ, SC, CEO, LOK, DBO, MVQ, RRR, HAM, TFO, OMC, USR, KFQ, RNG, ZS, DVB, BAX, ONQ, DUW, BET, BIP, EYU, OS, HB, QD, CHE, DZZ, CGB, AY, IUZ, VX, CEM, **W5**HGC, **W7**HTX and **W9**AIO.

This hamfest was so successful that a similar event is being planned after January, to which all hams in the Bay Area will be invited.

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The Washington (D. C.) Radio Club meets on the second and fourth Saturdays of the month at the Capitol Radio Engineering Institute, 3224 16th St., N. W., at 8 P.M., and welcomes all visitors.

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A new organization, the *Amateur Radio Experimenter's Society*, has been formed in Yonkers, N. Y. People interested in radio in the area are invited to attend the weekly meetings, which take place on Saturday evenings at 7:30 P.M. at 275 Mile Square Road, Yonkers, N. Y. The officers are: John R. Cano, president; Curtis F. Reed, vice-president; H. Stanley Graf, secretary-treasurer.

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"Give them a demonstration in a mobile unit!" says John Kiener, W8AVH, the energetic and go-getting radio aide of WJJH, the WERS organization in Cuyahoga County, Ohio. He has discovered, through application in his county, that this method never fails to sell "lukewarm" city officials on the idea of having WERS in their communities.

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Two hours after one of their weekly test periods the members of WKQR, the WERS group of Union City, N. J., were called upon to participate in a local emergency. A fire broke out in the Holy Family School in that city, and flames soon enveloped the entire building. The civilian defense director, sensing the seriousness of the situation, immediately pressed the local WERS unit into service. Members of the unit assisted in routing messages to civilian defense headquarters, which had sufficient facilities and personnel to relay messages by land line. The work was carried on in such efficient manner that all who took part in the local WERS net were given special commendation by the local authorities for rendering such splendid service.

# AMATEUR ACTIVITIES

## ATLANTIC DIVISION

EASTERN PENNSYLVANIA — SCM, Jerry Mathis, W3BES — Correction: 8EU did not see Brad Martin in Melbourne. 8EU visited Melbourne and met Brad at another place. Adams County is organized for WERS and the call is WPAC. 8RVM is located in Phila. now. 3HQE writes that he is in command of his own destroyer and is looking forward to a big postwar reunion with the gang. 3CDY tells us that the Harrisburg lads are getting CAP-WERS into operation. 3IPB is a corporal in the Signal Corps. 3HIE has been with Uncle Sam since Sept. 3AQN went in for wired wireless in a big way for the West York civilian defense setup; he is also making home recordings. 3UA is teaching an electronics class. 3GZZ got hitched a few months ago. 3JNT won a $500 war bond for the best suggestion in a war plant speed-up program. 3GZX has a new 400-watt rig using an 810 in the final. 3FNT is in the CAP with his Taylor Craft. 3HFG's new rig uses p.p. 811s. 3IXG and EDO are starting new rigs. The WERS situation in York is, "plenty of help from the hams but little from the civilian defense officials." 3ART is with the OWI. 3HYH, 3IQN, 3JNT and 3GZZ are in the electronics department of a York war plant. 3JIF is in the Navy. 3BBV sold a lot of his ham gear. 3HFF and HBC are doing war work in York. 3HFE is a commissioned Naval inspector. 3JBC had a two weeks furlough just before Christmas. 3JNQ is building a preselector for his Sky Buddy. 3IXN is doing the same for his Sky Challenger. 3HFD has completed his 112-Mc. f.m. transmitter and people who have heard it rate it better than his fine prewar 20-meter rig. Lower Merion WERS will use 224-Mc. in a big way to eliminate QRM. Easton has appointed 3HRE as radio aide It is concentrating on portable-mobile operation, having ten such units operating; and has a close tie-in with three neighboring communities. It has received the wholehearted praise of the local OCD. 3HRE is with the A. T. & T. and visited Phila. recently. 8PQQ, a lieutenant in the Signal Corps, a prominent W. Va. contest man and a DXCC member with 115 countries, stopped in to chat. He is stationed in Brookline. 3HFO joined the Navy as a radioman. 3JUC and 3JSU graduated from boot camp at Sampson, N. Y. 3EKK was selected for special officer's training at Fort Monmouth. 3GNA is taking photographs to send to Brad Martin. 3BYV is with the FCC in Phila. Shortly before the twentieth of each month jot down some WERS dope on a post card or letter and send it in to your SCM for use in this column.

MARYLAND-DELAWARE-DISTRICT OF COLUMBIA — SCM, Hermann E. Hobbs, W3CIZ — Reverend (Doc) Martin, LSPH, is currently engaged in dickering for parts to be used in his new WERS rig. Doc is ready to go; all he needs is his "walkie-talkie" rig. The stork recently left a lil' harmonic at Doc's place — an FB bouncing baby boy. Ray Martin, future ham, has received his orders to report in Uncle Sam's Army, and leaves one of the most elaborate SWL stations in this neck of the woods. Ray now holds a 3rd-class 'phone ticket. HPV, local b.c. operator at WITH, recently got married and went into the Army. His new QTH is: Pvt. Warren G. Oliver, Battery B, 517th AAA Gun Battalion, Camp Davis, N. C. HDT is readying his gear for an expected WERS permit. Bob has a dandy mobile rig, remotely controlled. HVD now resides in Fullerton, a suburb of Baltimore. HVD also is in love and spends his spare time pitching 88! JCS, formerly the 160-meter 'phone voice of Towson, is now at Lake Mills, Wis. He can be reached by addressing: Ed Bradley, Westinghouse, c/o Creamery Package Company, Lake Mills, Wis. HRI, that 2-watt 'phone demon, is now serving in the merchant marine. FSK is working at Bendix, Baltimore, as is OZ, EFB, GBY and some of the other local ham clique. AJX is working on a "secret" lil' rig. HVD's OW works at Bendix, Towson, and meets up with quite a few hams, one furnishing her transportation. FSK's OW worked side by side with HVD's mom, until recently. A recent advertisement in one of our local papers read: "For sale: Hollinafter's Sky Writer." Plenty of the local lads noticed it! Hi!

SOUTHERN NEW JERSEY — SCM, W. Ray Tomlinson, W3GCU — Asst. SCM, Ed. G. Raser, W3ZI. Regional EC for So. N. J., N. J. State radio aide for WERS and radio aide for Hamilton Twp. WERS, H. Dallas Fogg, W3ASQ. EC for Somerville and vicinity including Southbranch and radio aide for Hillsboro Branchburg Twp. WERS, P. S. Case, W3ABS. ASQ reports Maplewood Twp. received authorization for WERS operation under the call WKZW; this is the 29th municipality in N. J. to receive FCC authorization for WERS operation. Hamilton Twp. Radio Aide ASQ reports progress on this project and JOL has just recently completed construction on 2½-meter superhet receiver which has been tested with excellent results in Hamilton Twp. control station. The radio aide for Hillsboro/Branchburg Twp. set-up also reports progress with tests which are being conducted in an effort to locate dead spots in the territory. So far only one such spot has been encountered, and the boys are confident this obstacle can be overcome easily. ABS is also preparing another crop of students for 3rd-class ticket at the Hillsboro Twp. radio school. N. J. State Radio Aide ASQ also tells us there is much progress being made in several other localities throughout this state pursuant to WERS authorization. GHK is now warrant officer in Unk Sam's forces, having received this promotion before leaving Drew Field, Fla. Bill writes that he is in the Southwest Pacific. He sends his 73 to the gang, especially Matt, ex-BIR, and can be reached by mail as follows: W/O Wm. H. West, APO 709, c/o Postmaster, San Francisco, Calif. FBZ has been transferred to the West Coast on Naval duty. HLY is now in Unk Sam's "deep water fleet." CCC is now chief petty officer, Matériel Division, U. S. Naval DF Station, Amagansette, L. I., N. Y., and Ed's son, Blair, is now at Coast Guard radio school in Atlantic City — another ham in the making! QL is now warrant officer in Navy on foreign duty. The latest address of Eddie Peters, LSPH, is: Edward A. Peters, jr., S1c, c/o Fleet Postmaster, San Francisco, Calif. EED has been promoted to foreman of the receiving department at DeLaval Steam Turbine; incidentally, Les met GRW and ISY recently while enroute via train to the FCC and Marine Inspection Bureau, Phila. Paul and Fritz, both radio operators in the U. S. Maritime Service, gave him some good information and put him wise to the "ropes." HW is now chief-in-charge of all high voltage rectifying equipment at Aluminum Corp. of America, Burlington Plant, N. J. ITU is now a member of the operating staff of WVEA, Fort MacArthur, San Pedro, Calif. HVO is the latest of our members to join the ranks of war workers, having accepted a position with the C. V. Hill Co., Trenton. Major Sam Kale honored us with a visit to the Dec. meeting of the Delaware Valley Radio Association; and Billy Bryce, also a DVRA member, was home on leave during Oct. Bill tells us his training at Lexington Signal School is about completed. ZI's son, Ed jr., has now completed his first term at Cornell NCTP. IEQ, another of Unk Sam's Naval radiomen is also visiting home at this writing. EEQ's brother, "Kid Snedaker," also of "Uncle's" Naval forces, spent a furlough with the folks during Nov. Ex-EFE, formerly of Trenton, lately known as 6SPK, of Calif., is now with Western Airlines as radio operator stationed at one of their Canadian stations, and may be reached by mail as follows: Paul J. Binder, 10160 121st St., Edmonton, Alberta, Canada, Paul would appreciate hearing from some of the boys back East. Ex-GU, well known old-timer in these parts back around 1925, is now engineer in the production department at Eastern Aircraft. Ex-BOI, formerly of Trenton, has published a very interesting article dealing with a new system of speech scrambling and unscrambling which appears in the Oct. issue of *Electronics*. Bill is engineer at Sperry Gyroscope Co. JAG recently received his 2nd-class radiotelephone ticket. The Delaware Valley Radio Association has purchased two $100 war bonds. EDP is spending a vacation in Fla. FDF is continuing with his code and theory classes at the monthly meetings of the South Jersey Radio Association. We will greatly appreciate information regarding any of the boys in the services for publication in this column. This means a lot to the boys who read it. Come on, fellas, let's keep old South Jersey on top! 73.

WESTERN NEW YORK — SCM, William Bellor, W8MC — TEX has just completed an FB new signal generator which can count down to one cycle. It has been occupying TEX's odd hours instead of ham radio. Warren Wheeler of WHAM has recently finished a new v.t.v.m. This is an odd hobby of Warren's and should be worth a description in *QST*. NCM has been in town a few days

enjoying a belated honeymoon. Fran is at Sampson Training Station Hospital convalescing from wounds received in active service and is coming along well.

WESTERN PENNSYLVANIA — SCM, E. A. Krall, W8CKO — TTD has been advanced in the Central Signal Corps School to the duty of instructing in the fixed station equipment and finds it most interesting. He would like to hear from TWI, NCJ, TOJ and other stand-bys of the ORS and AARS nets. Write him at 1214 Commercial, Neosho, Mo. TTJ, formerly of W. Pa., is now code instructor, C.S.C.S. TVA is still in Brazil and would trade his QTH for one in the U.S.A. TTN's address is APO, San Francisco. OMG is in bomber-fighter school at Galveston, Tex. DHW is a wing surgeon and has been piloting a C-78 by way of diversion. Address him: Major R. C. Simpson, 0295208, APO 525, c/o Postmaster, New York City. NCJ still spends time copying 20 to 40 w.p.m. NUH of Clarion is planning his postwar rig. RTU, USN, recently had shore leave from a U. S. carrier. We hope he has fully recovered from an appendix operation. MP has moved to Chicago and will be a postwar W9. BHN is deep in WERS research and operation. VYU is kept busy with college work but still has time for CAP radio. Lt. KWA and Dottie are still at the U. of Houston. As all appointments except EC have been canceled, certificates should be held until after the war. Let's start the ball rolling this new year by sending in a monthly report to the SCM.

## CENTRAL DIVISION

ILLINOIS — Acting SCM, George Keith, jr., W9QLZ — PTQ gets a thrill from reading *QST* in Italy where he is a staff sergeant working with radio service. NIU adds another harmonic, this time a YL. BIN, vice-president of the Starved Rock Radio Club, was inducted into the Army at Fort Sheridan, Jan. 7th. DAX and WVH are busy cutting and grinding quartz for the war effort. VFS is overseas with an armored division. OXA has been promoted to the rank of major. ZEN is RM2c aboard a Coast Guard cutter on the Great Lakes. YBY hopes to wind coils on a lathe after the war is won. The following are still on deck with the Chicago Suburban Radio Assn.: MAT, FCN, PNV, FVU, PGW, DZJ, RLM, PPQ, MZN, YQC, LMZ, QLY, HYU, USJ, PMJ, PK and 8LVV; all active in WERS at WHHI or WKDQ. PGW has radiotelegraph 2nd and would like to use it in the merchant marine. PEQ is with General Electric in the East. A brother of TAY is repairing communications equipment with the armed forces in England. The Joliet club is holding its own with regular meetings. 73 — *Geo.*

INDIANA — SCM, Herbert S. Brier, W9EGQ — Indianapolis WERS station WKPZ, DLC radio aide, arranges test problems and simulated emergencies which are solved during test periods. In a simulated flood along the White River, fifteen units were in operation. Inter-communication was possible between all units. Part of Gary's OCD organization has been disbanded. However, WERS has been retained and will be increased in scope if possible. The OCD director spoke highly of it, and the competent work of MVZ, the radio aide. Gary hams loaned equipment for a window display of the WAC's duties in Army radio stations. Ft. Wayne has about ten "walkie-talkies" ready for operation if those long-promised batteries ever come. Elkhart County WERS is working well except in Goshen where there are no units in operation. AKJ is now radio aide. SVH didn't have enough time to continue. Highland WERS is still marking time. YGH hopes that some day some of the new operators will get their permits. Bloomington, HBD radio aide, is still waiting for its license. QG is an engineer for a company that makes lots of aircraft instruments. He runs into many problems which he solves by use of vacuum tubes. EHT reports that the Navy appears to be going to send him to polaroid school to learn how to train anti-aircraft gunners with movie-projectors and amplifiers. SNF is stationed at Amarillo, Tex. EMQ reports that Anderson WERS units work much better since they obtained some HY-75s. He arranged a display of radio equipment at a hobby show. PBS is "DXing" on the b.c. band. He uses a loop antenna, and has recently heard G, K4 and K6. KMY is a warrant officer in a tank unit. IIL, back in Fla. after studying English equipment in Canada, is going to another school several nights a week. SAG is in Conn. doing research work for the Navy, and is a scout master in his spare time. KBL is in N.Y.C., and is still trying to convince the gang he actually used an antenna on 80 meters. BNR's son was made a signalman in the Navy after mystifying the signalman on his ship by telling him what he was sending by hearing the clicks of the blinker. YWE is an operator in a Signal Corps receiving station. Jack goes to school, where he is studying radio engineering several nights a week. UEM operates WKPZ-32 when the express company lets him off. MTL is building a superhet to cover from 28 to 150 Mc. The transceiver which JZA loaned Gary WERS is the marvel of the age. Using a 6J5GT and exactly the same circuit as several other units, it has far more output when transmitting and is more sensitive when receiving than the rest. DLI is making aviation gasoline. AB continues to experiment with f.m. and superhet receivers for WERS. OUQ is now a 1st lieutenant in the Army. He is serving in Africa where he recently received special commendation for outstanding performance of duty. I would like to receive more reports. 73 — *Herb.*

MICHIGAN — SCM, Harold C. Bird, W8DPE — 8FX writes he is experimenting with an old c.w. gadget to use for a demonstration at some future hamfest. 8UFH writes from New Haven, Conn., where he is attending a technical school. He is an aviation cadet and has completed officer's basic training in Fla. and N.C. 8UGR says he has just sent in another story to *QST*. On a visit to Lansing recently I had the pleasure of talking to a member of their WERS staff, who reports that they are holding weekly drills and have received reports on their signals from Saginaw. They are equipped mostly with mobile rigs and have worked a distance of twelve miles. Deputy Radio Aide Chevillot, of Detroit, writes that their set-up is composed of thirteen areas and a fixed station located in each area. All fourteen stations are uniform in construction and built according to the recommendations of ARRL and described in Dec., 1941, *QST* and subsequent issues, and in the 1943 *Handbook*. Very satisfactory results have been obtained with an average power of 18 watts input. The antennas consist mostly of three wire folded doublets. They also have twenty-five mobile units and, although the power is somewhat limited, all mobile units have been working into control station direct with 100 per cent readability. This means about fifteen miles coverage. The following deputy radio aides are in charge of each area: 8TKL, 8WYG, 8UYG, 8TDO, 8SYX, 8SWI, 8CQQ, 8VAF, 8EWO, 8HUD, 8TQW, 8TQP, 8SPO, 8VNH. Lt. (jg) 8SPF, who has been at the U. of Maine, was home recently on a furlough. DARA has gone in for code teaching again, now that Past-President 8RX has been made a lieutenant in that outfit. How about some dope on your WERS activities? The Flint WERS gang has recommended 8QBO for appointment as EC. The Pontiac WERS gang is working hard to get the rest of its stations completed and installed. Several tests have been made with very good results. Signals were reported in Detroit with fairly good intensity. The gang is also contemplating a code and theory school, so the old-timers can brush up and the new-comers can get started. Center Line WERS is having excellent results and is keeping up weekly drills. Until next time, 73 — *Hal.*

## DAKOTA DIVISION

SOUTH DAKOTA — SCM, P. H. Schultz, W9QVY — ZBU writes that SGI has left his job with Consolidated and is now working as an electrician at Willamette Shipyard in Portland, Ore. BZI is on board a ship in Pacific waters as RM2c. MBA has been promoted to CRM and is an instructor at a Naval training center in N. Y. ZNM is still with the CAA at Ashley, N. Dak., and writes in quite regularly. He states that YNW has been put on a semi-permanent assignment on the West Coast. Anyone wishing to write to Rod may secure his address from Ad. ZRA is still with the 147th F. A. and keeps in contact with Rod and Ad. QQQ is now with Douglas Air Craft in Los Angeles. IBP is at Brookings, evidently attending school. He sends the following dope: MRS has been an operator in the Navy for the past three years with assignments in Panama and the South Pacific. While home he acquired an XYL. PHC is finishing his training as a Navy pilot at Pensacola, Fla. SBF has been in England for the past few months. ADJ, GLA, BLK, YOB and OPS have built a complete crystal-grinding outfit and are intending to build an all-band crystal tester. They have their sights set on an all-wave frequency checker. Thanks to all who have sent in material the past year and I hope you will continue to in the future. 73 — *Phil.*

NORTHERN MINNESOTA — SCM, Armond D. Brattland, W9FUZ — DPU has been sent overseas. His address may be had from the SCM or his mother, Mrs. Leo

Kiewel, Crookston. BBL, of the Coast Guard, visited St. Paul. MSW joined her husband, BCT, a Navy lieutenant instructor stationed at Brunswick, Me. UCA is in radar in Tex. FUZ and YF visited OVB and family. OVB teaches code three evenings a week to classes sponsored by Ry. Post of American Legion in St. Paul. JNC, c.w. operator at Northwest Airlines, has left for Air Corps. EHM wishes to extend "ham hospitality" to hams of Northern Minn. visiting in N. Y. Call Talmadge 9-4738. His address is 1705 Purdy St., N. Y. 62. KFF is CRM on a liberty ship. FUZ has gone to the West Coast to take another hitch in the merchant marine radio service. Mail addressed to this SCM will be forwarded to his family on the West Coast if sent to Bemidji, Minn. 73 — *Army.*

### DELTA DIVISION

LOUISIANA — SCM, W. J. Wilkinson, jr., W5DWW — Ex-K6POR, now stationed in New Mex., was a recent visitor in Shreveport. FJW is now editor for YLRL and would appreciate YL dope. HEK is back in Monroe after doing a trick with the Signal Corps. INN is working at signal repair section sub-depot in Monroe. DRF has a new QTH and invites hams to see his new shack. IRO and EB visited in Monroe recently. ADJ is still missing his 160-meter kw. job. HNW is located in Seattle with the Navy. BTH is having trouble with newsprint shortage. BQD is teaching theory up around Memphis. DXL is with the AAF somewhere in Italy. IVF is getting his basic training in Fla. IIG is somewhere in Africa. JET is with the Navy and wants to try 14-Mc. c.w. from Africa. JEY is planning a new rig for postwar use. CNG is with the Signal Corps in Atlanta. HOS is having tire trouble. AKJ is fixing radios when he can get tubes. AKT is working with the Sterlington Power Co. JPI has joined up with the merchant marine. The XYL of IDK says he still calls "CQ 160" in his sleep. IPX is back watchmaking. HCV is stationed somewhere near Washington with the Army. CRV was headed in that direction when last seen. EGK lost his antenna poles. HQY has been transferred to Monroe. ERV is waiting for a crack at someone on 40 c.w. KJE is awaiting a call from the Army. HUY is in Atlanta. HFI was home on furlough recently. HEJ is working at the sub-depot. EBB wrote from somewhere in Africa. BYY and FUS visited in Shreveport. EEL is with the CAA staff in Oklahoma City. GYO is working for KWKH. BGC has been made 1st lieutenant. BZR reported hearing WERS station KGFA of Shreveport in Minden, La. BMM is having diathermy troubles. Let's hear from New Orleans, Baton Rouge, Alexandria, Lake Charles and all other parts of the state. Thanks to HEJ for most of the news this time. 73 — *Dub.*

### MIDWEST DIVISION

IOWA — SCM, Arthur E. Rydberg, W9AED — JIH reports the Linn County Radio Club of Cedar Rapids has its WERS application on file. It is conducting a series of lectures and demonstrations and is starting classes in radio theory. The local newspaper is giving real coöperation regarding publicity. OOL, CAP wing communications officer, State House, Des Moines, states that a CAP-WERS license has been issued by the FCC for activities throughout the State of Iowa. The call is KGVL and operating frequencies are 115.2–116 Mc. Eleven transmitters have been licensed with a power output of from 0.45 to 25 watts; more are in the process of being built. Some of the active hams are: BQT, NLE, CJE, MCK, CHA, WTD, TMY, QVA, Sumner Foster, P. H. Byars and B. L. Schultz. MCK is communications officer for the Des Moines Squadron and conducts code classes twice a week for the squadron. AUL is a basketball fan. URK and OLY have gone in for photography. ANI, formerly of Des Moines and a recent visitor, is now in charge of the U. S. Weather Office in Spokane, Wash. Last month EMS was left off the list of hams who are taking the ESMWT electronics course at West High School, Des Moines. MCK is a proud father. GWS, a radio mechanic in the Air Corps at Eagle Pass, Tex., was home on a furlough. AHP is building a ham shack in the basement. 73 — *Art.*

KANSAS — SCM, Alvin B. Unruh, W9AWP — KFH is now a warrant officer (RE) and says it is the type of work he likes He would like to hear from KNW, also of the Navy. EOU, formerly of Bendix, is now in the radio lab at Boeing in Wichita. YYW was home on furlough to visit his YF, ZUY. NQX, a lieutenant (jg) in the USNR, is stationed at the U. of Ariz. Thanks to our YL friend, CMV, for the dope on VK4JP, who spent considerable time in Kans. several years ago. George has been stationed at an ack-ack battery. UFQ is now a sergeant in the Army. Ex-CPN is now 4HXM. Kenneth Hearle, Signal Corps (operator's license), is now stationed in Va. and would like to contact UFQ, ex-CPN and Barney Egbert. The Wichita Amateur Radio Club is being reorganized, and plans are to meet monthly for a general ragchew, with occasional feeds or picnics. Because so many hams in Wichita are working on swing and graveyard shifts at defense plants, the meetings will be held on Sundays. Let's hear from you. 73 — *Abie.*

MISSOURI — Acting SCM, Mrs. Letha A. Dangerfield, W9OUD — The new QTH here is Box 123, Butler. I had three V-mail letters this month — one from my brother, 4HLN, ex-IGW, who was in North Africa with the merchant marine at the time of writing. PYF wrote that he was in a foreign country and discovered the port radio inspector was a ham. Roy has been in the merchant marine since last Feb. He suggests that all the boys and girls write Headquarters, telling of their part in the war to help us in regaining our former frequencies. We remember that KCG wanted PYF's address. Now if we can find where Alec is we can get them together. TGN wrote from the South Pacific saying nothing, but indicating he could tell a lot. The surprise of the month was a card from CZU, ex-8QQK. The present QTH is Panama and the title is first lieutenant. EFC is back in Mo. after receiving a release from Raytheon. OWQ is thinking of selling her transmitter, but keeping the power supply and also her *QST* file. NIP sent in some dope about the Columbia gang as follows: AOP, RT2c, has seen some very hot action in the Navy — his OW is still in Columbia. QOB managed to get a new car to get to and from his work, which is with Bob Henry out in Los Angeles; BRN is out there, too. QXO is radio aide with WERS in Columbia; he and FRG are the OCD standbys. WBM and YRV are senior electrical engineering students at MU; ETF is one of the professors. QKZ got his EE degree and went into the Army in Dec. VEE, who has managed a local Firestone store for years, has been transferred to Jeff. City. JPE is in Washington, working on that teletype equipment described in Nov. *QST*. NIP got his telephone first in May and is now flipping switches and platters at KFRU. GDY, who travels part of Mo., Ia. and Kans. as theater sound engineer for RCA, was in Unionville, Mo., when the cut was made in the value of B gasoline coupons and had to talk the local rationing board out of more coupons before he could get back to K. C. AOA is radio operator with the Airborne Command, Camp Stewart, Ga., and FSI is in the merchant marine — according to a letter from EQA who is teaching radio in high school and working at KFEQ in St. Jo. ZVJ is training to be a pilot with the Naval Air Corps. His sister, ONW, was transferred from Scott Field last Jan. and is teaching c.w. to Army Air Corps cadets at Yale. BPZ, RM2c, and ZVM, RM1c, are with the Coast Guard, working out of St. Louis. VZU and YCB are working for Raytheon at Waltham, Mass. BIU has been in the Army fifteen months and is now an aviation cadet in primary flight training at Corsicana, Tex. ZAO is with the highway patrol in Poplar Bluff. FTD likes operating with the 1st Airways Command Squadron where he has been for the past year. During his training period he learned to use a mill and was copying twenty-five within six weeks. In his spare time he now is studying for a commercial license — he used to work 160 'phone and 40 c.w. He would like the addresses of DDX and RVY. NUS had a nice Thanksgiving with several members of his family home. WIN has been transferred from Wichita to Kansas City by the CAA — and welcome to Mo. BMS and OUD saved up their gasoline and went down to Joplin, Dec. 4th, for a birthday celebration, that being their common birthday. Gang, you did a swell job with the news this time. I have addresses of quite a few of the boys and will be glad to share them with you. The very best of luck to all of you. 73.

NEBRASKA — SCM, Roy E. Olmsted, W9POB — I received word of the sudden death of a brother-in-law, the father of QGE, and did not return home in time to send in a report for last month. IPZ, RT1c in the Navy, gives this column a boost and sends special regards to FSR, EAT, DXY and other ham friends. DMY offers dope on several amateurs in the SE corner: IEO has quit farming to enter defense work; JEE is still carrying his mail route and converting his extra time into useful labor; WPF is working for the airlines at Cheyenne; HKB has returned to his farm in Kans.; DGL, DMY and JXN are all railroad Morse operators and are "on ice" for the duration; GBK is still working for Western Union; DI has been radio instructor at Scott

Field for over two years; PLO cranks a cinema projector seven days a week, and ESY has returned from Naval service in the Pacific area and reports for a new assignment. WZB claims that he is the only living ex-mayor of Cozad and ex-deputy-sheriff of Dawson County. He offers information regarding EKP and JCB. Bill has been on the West Coast for two years and is now working for an aircraft plant, inspecting radio and radar equipment for airplanes. DCC sends a card to report his activities, SPH radio instructor at Kearney NYA school, then radio mechanic for Inland Airlines at Cheyenne. He now goes to Wright Field for radar modification work. LEF is still picking at that 185 acres of corn and it is yielding close to 250 gallons per acre! EAT/KGLZ reports that NXF, RM2c, was last heard from serving with the Navy in the Atlantic sector. NPL, at Patterson Field, is doing radar installation work. EQM has received appointment and is awaiting his call as a procurement officer with the AAF. YFG is in the Army. CLK has returned home from the South Pacific area and it is rumored that he intends to commit matrimony in the first degree. ZHC has a position as factory instructor in a West Coast aircraft plant. YCG/KFWC-2 sends a nice letter, describing the equipment used in the WERS set-up at Brainard. OHU called at this station last week, enroute from CAA range station at Fort Bridger to his new location at Lincoln Airbase station. KLD, Naval CRT on the East Coast, writes to say that he is serving as an instructor in radio materiel and enjoys the work he is doing as well as the Nebr. items in *QST*. He adds that, at one time, 80 per cent of their staff were amateurs. YOD is working for Peterson Radio, helping make little rocks out of big ones. Edward Kruse, class B and graduate of NSTS, reports from Camp Davis to say that he is copying 35 w.p.m. and attending Signal Corps school. He says he expects to join ARRL soon and get on the air at the first opportunity. QOA writes a swell letter from somewhere in N'Yawk and states that they used 40-foot bamboo poles for antenna masts at their last station. As most of our AARS netters recall, Sam has been doing civilian radio engineering work for the Signal Corps. RGK contributes from Gering and admits that his nose gets to twitching about this time each winter. So he goes over to his neighbor, SDL, and borrows eight copies of *QST*. And then — he starts working on his "Kalifornia Kilowatt" where he left off on Dec. 8th, so he says. Here's to all of you and a Fightin' '44 — *Pop*.

## NEW ENGLAND DIVISION

CONNECTICUT — SCM, Edmund R. Fraser, W1KQY — Your SCM has been elected to serve another term. He wishes to thank all who furnished reports to keep this column operating and asks for the coöperation of all. KAT, while attending meter school at Newark, visited with our old friend, 2HCO, of Hackensack. Matthews, Trumbull radio aide, recently dropped in on the SCM for a visit. Sanchione, Bridgeport radio aide, reports five new operators licensed. WERS YLs Nettleton, Betts, Wilmot, Stevens and MRC are doing a splendid job as operators. A new antenna is being erected on WKAO-75 Bridgeport control center. Stratford units 40, 31, 32 and 33 are operating very smoothly along with 35 in Trumbull operated by ZT, 38 in Easton operated by GRU and 9 in Fairfield operated by EYM. Ex-SF, Branford radio aide, has overcome the problem of interference between units at the control center, with new antennas increasing efficiency. IGT, New Haven radio aide, has WERS units operating now on both the Wednesday and Sunday test periods with considerable efficiency in procedure. MEF is recuperating after a recent heart ailment. IJ has been furnishing WJLH with v.h.f. data on antennas, wave traps, etc., as well as licensing four new WERS YL operators. WERS YLs Nicholls, Gray, Smith, Sheldon, Tyler, Conte, Doyle and Tracy of New Haven; Desmond, Bugbee, Moore and Dillon of West Haven; Wannamaker and Peck of Guilford, and Jackson and Hewitt of WJLH-1 deserve high commendation for the excellent operating they are doing in the WJLH district. FMV, deputy district radio aide, has been monitoring WJLH units during test periods.

EASTERN MASSACHUSETTS — SCM, Frank L. Baker, jr., W1ALP — HSB reports that the WERS license for Norwood under the call of WKQN was received in July. Norwood has two hams and three 3rd-class operators, four units, two mobile, one walkie and key control station, and works into Newton. The Norfolk County Radio Club held a meeting at AGR's to welcome HTR home. AGR's XYL put on a supper for the eight hams present. John Doremus has resigned as director of radio communications for the Mass. Public Safety Committee and GAG has been appointed to take over in his place. Gardner, Leominster and Fitchburg have been licensed under the call WLOS. NAX and JOY are now working at M.I.T. NBT, who was in the Army, is home again. AKY is working at Harvard. HRF and IKK are still there. CTR is working at Raytheon. IYU is working at WRUL. KII was badly burned at his work recently MTV, who is working at M.I.T., says that he expects to go into the Navy around the New Year. Ralph Warner, who lives in Quincy and who was on the air back in the ole spark days, has the bug again, and is studying up for a ham ticket. FKV has moved back to Marshfield. MQO is now chief in the Coast Guard and is at M.I.T. On one day's notice a gang of hams got together and had supper in Cambridge recently. Those present were: IHA, DA, HA, BYY, IN, EKT, AYG, HDQ, IBF, KTX, LZV, JMY, ALP, 6OVK and 6OE. Everyone had a swell evening, just like old times. HQY and IN are expecting new arrivals in their homes. CZO reports that WERS is working very nicely in Melrose; several of the hams have joined the Coast Guard Temporary Reserve. The Hi-Q Club of Lynn is now meeting bi-monthly and showing increased interest in postwar operating. The T9 Club is still holding meetings each month. The South Shore Amateur Radio Club is going to hold one meeting a month at the Quincy Y.M.C.A. in Quincy Square, probably on the first Friday of each month. Any hams who are in this vicinity are welcome to attend. NKW sent out a very nice QSL card with the Christmas Greetings as follows, "The QRT for the duration, we are going to be QRU, for the Day of Victory is nearing. Then we'll QSO with thee." IJW's car is over at M.I.T. The WERS licenses for Boston and Quincy are expected at any time. KH was in Cambridge recently and your SCM had a nice chat with him. JCK is still around Boston. BDU is still hanging on. NRS and NSH, both former Signal Corps employees, are stationed in Ind. for radio technical training.

NEW HAMPSHIRE — SCM, Mrs. Dorothy W. Evans, W1FTJ — It's good to know that LIN, who is RM1c, is now back in Mass. MIP was home on leave recently. ITF enjoyed a birthday Nov. 13th. CFG was able to get home and spend Thanksgiving Day with his family. LVG reports a "back to school" movement for him, and says he's thoroughly enjoying it all. NEI is attending school in Boston. NGK is in the Army. LMC is on foreign duty. FX is repairing b.c. sets and working for the local power company. BST had a sailboat this summer (has bought Rum Island at Lake Winnipesaukee, we understand) and has been fooling around with photography. ARM is active with the CAP and is still in the insurance and real estate business. GVJ moved to Conn. some time ago and nobody seems to have heard from him recently. KKQ is having an FB time with the WACs and would like to hear from her friends. Our heartfelt sympathy to MWI, HFO and JKH on the death of their fathers. FTJ thanks the N. H. Section for coöperation in the preparation of this month's report. I am sorry to have had to omit reports in a few recent issues, but if I don't hear from our boys, then there's just no news to report, so please help us out by keeping in touch with the SCM. It makes things so much easier for everyone and keeps N. H. on the map!

RHODE ISLAND — SCM, Clayton C. Gordon, W1HRC — A very fine letter was received this month from Winston F. Armstrong, RM2c, c/o Fleet Post Office, N. Y., in which he says he picks up his *QST*s when in port and catches up on his reading while at sea. He was formerly a salesman and repairman at the City Hall Hardware, but joined the Coast Guard in Dec., 1942. He inquired about Charlie Fraits of Lakewood and Jerry Mason of Westerly. Charlie is now living at 2805 Ralston Rd., Mobile, Ala.; he is married to a southern girl and is in a new job. 8HMJ is working in Providence and has promised to pay a visit to the SCM's shack. A really swell letter was received from ex-KZN (ex-2OPH, ex-4HXN), Lt. Norman E. Tetreault, APO 464, c/o Postmaster, New York City. I hope you fellows and gals write Norm a nice bunch of letters now that we've put him up as our "ham-to-write-to-this-month." A letter from MWK, once of Jamestown, R. I., and now RM3c, USNTS (Radio)-C21, Auburn, Ala., is just chuck full of news. He keeps in touch with MEK, who is overseas. MEK's address is: Sgt. R. E. Young, 12201032, APO 525, c/o Postmaster, New York City. Bob told Andy he recently ran into NCA, formerly of Providence, and they had a real get-together. Andy also said IRF, of Newport, is now a lieutenant in the Signal

Corps and is somewhere in Canada. Andy is teaching radio "the Navy way" at Alabama Polytechnic Inst. and is living with 4HLK of N. C.

VERMONT — SCM, Burtis W. Dean, W1NLO — KXL, formerly of Johnson, received a write-up in the Burlington Free Press about his experience at sea as radio operator. "Chink" was stricken with a nosebleed that could not be stopped, during a storm in the mid-Atlantic. Adrenalin and blood plasma were transferred from a destroyer to the freighter and the cargo officer administered the plasma and performed an operation on KXL. "Chink" recovered and is back pounding brass for the merchant marine. EKU is now in the Army. CGV has passed his preliminary exams at Rutland has been recommended for the rating of RM2c in the ship repair units of the Navy. BD and NLO recently visited ATF. IQG is working in Cambridge, Mass., and lives at 13 Chauncy St., Cambridge. LWN is at the Burlington Airport working for Colonial Airlines as chief radio operator and maintenance man. GAE, in Idaho, writes that he likes the mild weather out there but would like to be back in Vt. KWB and XYL are keeping WHEB in Portsmouth, N. H., on the air. JVS is working for Bellanca Aircraft Corp. in Del. There is another YL ham in Vt., Norma Fremeau, LSPH, 170 North Ave., Burlington. Norma attended the NYA radio school in Waterbury and has Class B operator and restricted 'phone licenses. Your SCM journeyed to Schenectady, N. Y., and got his 2nd-class 'phone ticket. He also visited 2ANM, 2CHA and 2NBF. MET has been promoted to the rank of captain and is stationed overseas. 73 and CUL — *Burt.*

## NORTHWESTERN DIVISION

OREGON — SCM, Carl Austin, W7GNJ — EC: 7JN. CZJ is doing electrical work in Chicago, but says that he and his family are planning on returning to Ore. after the war and putting up some real antennas. HAL says he can detect no WERS activity yet. He has a rig which has never been tested. A card from HLF brings some interesting notes on WERS. With his truck mobile, he has worked about thirteen miles so far (Medford to Ashland), with a full-wave antenna, ninety-four inches from tip to coil, used as a Marconi, for 114 Mc. He also mentions that sometimes the signals can be brought up as much as three Rs by moving six or eight feet forward or backward. AKC, of The Dalles, has taken up recording until ham activity reopens. GNJ also keys or talks an occasional record, with the assistance of HHH. HKI is again having receiver trouble. WH reports no news. 73.

WASHINGTON — SCM, O. U. Tatro, W7FWD — In the newspaper we read, "Broadcasting an SOS to all radio hams, the War Emergency Radio Service today began setting up a short-wave radio circuit that will supplement, or, in emergency, supplant regular city-wide communication lines and urges all radio bugs to volunteer for the new program. . . . Seven permanent sets will be established in zone sub-stations and from them 200 hams will operate fifty or sixty mobile sets. The network may be used for communication between civilian defense officials in separated districts. Even when the war ends, the circuit will remain in use for possible civic disasters." Subsequently this appeared, "Enrollment of more than thirty ham radio operators last week will make it possible to hold organization meetings. . . ." From the foregoing it appears that the radio amateur in Seattle has been sought and is responding. Please, someone from Seattle, write me the facts. HML is RT2c, and has left A & M for Treasure Island where he will soon graduate. IJZ, RM2c, now somewhere in the Atlantic, took unto himself an XYL. EKW, a lieutenant in the USNR on foreign service, writes, "It is a fact that all the gifts or gold in the world could not take the place of the letters one receives. Letters do more than anything I know to keep up the spirits of the forces that are away from home. On the whole they (the soldiers) have everything else they need." Write a letter to that lad who is serving for you. He deserves no less. 73 — *Tate.*

## PACIFIC DIVISION

SANTA CLARA VALLEY — SCM, Earl F. Sanderson, W6IUZ — Chas. Holdiman, jr., ex-W6/W7, is now stationed at Fort Monmouth and has been commissioned a 2nd lieutenant. He writes that he would like very much to hear from any of the SCCARA gang. How about the rest of you fellows who are in the services and in war work dropping a line so we can clear all the dope through the activities section. CRM DBK is serving with the Navy. His address is Navy 236, c/o Fleet Post Office, N. Y. C. HJP is now a 1st lieutenant in the Air Corps. His address is 73 Bombardment Operational Training Wing (H), Smoky Hill Army Air Field, Salina, Kans. MOV/OPG, who is now a 1st lieutenant in the Signal Corps, was in San Jose for a few days while on leave. Tentative plans are afoot with a view to holding a real honest-to-goodness hamfest the latter part of Jan. or the first part of Feb. Watch for more definite information via mail and bulletin and be sure to attend if you possibly can. Come on now, fellows, let's have those cards and letters with all the dope so we really can have a repo t for this section. 73 — *Sandy.*

EAST BAY — SCM, Horace R. Greer, W6TI — I would like to take this opportunity to express my sincere best wishes for a very happy 1944 to everyone, everywhere. During 1944 it is possible that the present world conflict will come to a close, permitting all of us once again to continue our amateur activities. Our efforts in all branches of the service of our country have been outstanding and we will always pay tribute to our brothers who have passed beyond and to those who have helped to carry on the traditions of amateur radio.

SAN FRANCISCO — Acting SCM, William A. Ladley, W6RBQ — Asst. SCM: GPB. ECs: DOT, GPB, RBQ. Staff Sgt. JWF paid a short visit to his family on his way to McCook Field, Nebr., from his location in Tex. His new address is: 465 Bomb. Group 783rd Bomb. Sqd. H, McCook Field, Nebr. 5UN, assigned from New Orleans, is now living in S. F. and has joined hands with our local WERS group. Letters have been received from CIS, EAR, RH and ZF, all reporting their activities in the armed forces. RFF is now a married man but still active in WERS. Ex-K6SBU passed through here recently and is operating for Signal Corps. We learn from GPB that the Marin gang is planning another get-together at San Rafael in the near future. DOT, our radio aide, advises new zone aides for WERS are: zone one, KZP; zone two, EVI; zone three. LFZ. EKZ, formerly of L. A., is now a resident of S. F. RH advises he is now located at Boston. ZF advises he is leaving Philadelphia. Ex-9YGS is attached to the Navy here and is active in regular WERS drills. Radio Aide DOT is about ready to install two new WERS units on 224-Mc. Assistant SCM GPB, of Marin, advises no activity from that side of the bay. BUJ is active in WERS and doing some building as well. Lt. HJ attends all WERS drills regularly. A letter from ex-PPO, an ardent 112-Mc. enthusiast, now 7JIA, advises he has resigned as manager for Square D Electric at Portland, Ore., and is back at sea with a master's steam license with the U. S. Army. CVP, past-president of San Francisco Radio Club, is active in WERS with a new portable-mobile outfit. KB6ILT, now located at Seattle (formerly at Guam), has been advanced to rank of ensign. EY keeps in touch with activities in this section. AY, at Eitel McCullough, reports that a gathering of all their amateur employees was held recently at Crystal Springs and the following hams were present: TGH, WN, LV, BCV, EHW, UF, AAZ, SC, CEO, LOK, DBO, MVQ, RRR, HAM, TFO, OMC, USR, KFQ, RNG, ZF, DVB, BAX, ONQ, DVW, BET, EYU, OS, HB, QD, CHE, DZZ, CGB, AY, IUZ, VX, CEM, ex-BIP, 5HGC, 7HTA and 9AIO. CIS has resigned as SCM since his transfer to Bremerton. News comes from T/Sgt. IPH, who is pounding brass for the Army in North Africa. Please, fellows, send in news items on a postal. Let's try and make this column bigger and more newsy. 73 — *Bill.*

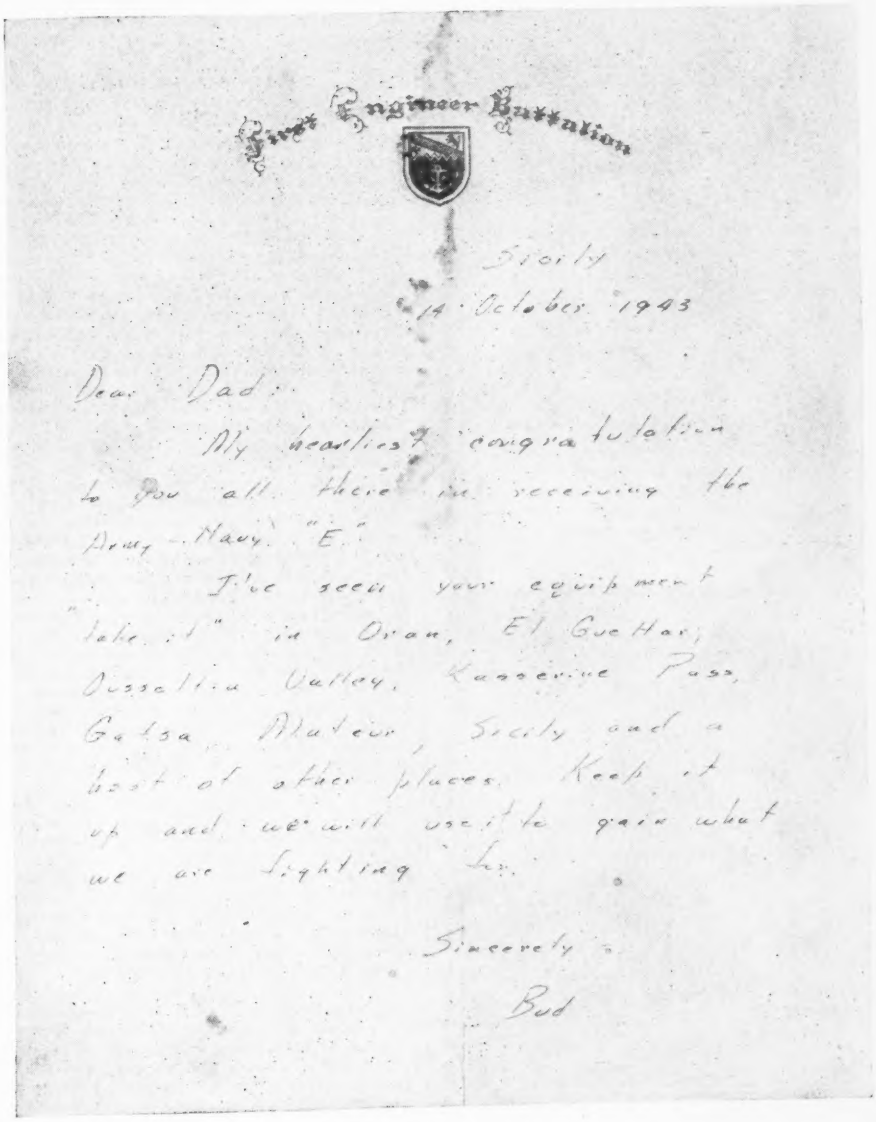
## ROANOKE DIVISION

VIRGINIA — SCM, Walter G. Walker, W3AKN — HJW and IIF, who left their jobs as Naval inspectors of radio equipment, are now with the Raytheon Mfg. Co. IIF is now located at the Atlantic Hotel, Norfolk. He reports that a large number of hams are connected with Raytheon, and a hamfest of large proportions took place at one of the Boston hotels early last month. IEX, a lieutenant in the USN, is now located at Point Montara, Calif. Major HZU, who left these parts hurriedly the morning after Dec. 7, 1941, and who has since been a thorn in the side of the Japs, is now back in the U.S.A. He is located at West Palm Beach, Fla., with the Army Airways Transport Command. While on a tour recently he saw Major 4BC at Presque Isle, Me. Col. HWJ is still located with the War Department General Staff at the Pentagon Bldg., Washington, D. C. 73 — *Walt.*

(*Continued on page 78*)

{Number one hundred nineteen of a series}


# A Letter from a Boy Who Is Doing His Part to a Father Who Is Doing His Part



First Engineer Battalion

Sicily
14 October 1943

Dear Dad:

My heartiest congratulation to you all there in receiving the Army-Navy "E".

I've seen your equipment "take it" in Oran, El Guettar, Dorsalian Valley, Kasserine Pass, Gafsa, Mateur, Sicily and a host of other places. Keep it up and we will use it to gain what we are fighting for.

Sincerely,

Bud

Letter reproduced in facsimile

# Amateur Activities

*(Continued from page 76)*

## ROCKY MOUNTAIN DIVISION

COLORADO — Acting SCM, H. F. Hekel, W9VGC — WJJ is now located in Phoenix, Aris., and is one of the head men of KTAR. JBI holds the rating of RT1c and gave his address as D. E. 243, c/o Fleet P. O., New York, N. Y. JKC, RT1c, is chief operator at the Naval radio station, Astoria, Ore. VIK is attending the university at Houston, Tex. 6UTL, ex-LFS, is now living in Denver and expects to make it his permanent home. Ex-SNB–ex-7HEH, is employed by the Navy as a civilian. He gave his address as: Navy 28, c/o Fleet P. O., San Francisco, Calif. The Bell Radio Amateur Club held its quarterly meeting at the home of Don Wells (LSPH). Most of the evening was spent building model railroads. This is not electric toy stuff but real handmade trains and built to scale. CAA says he is enjoying the hardships of a married man with a sick family; one boy has a broken ankle and the rest have the flu. Send me a card or letter with the dope about yourself. 73 — *by Heck.*

## SOUTHEASTERN DIVISION

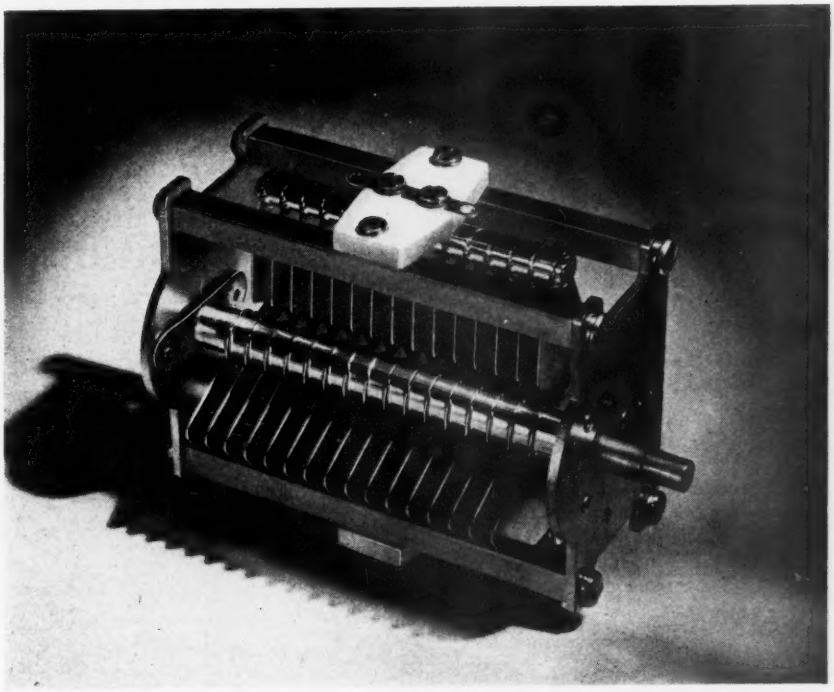
ALABAMA — SCM, Lawrence J. Smyth, W4GBV — APJ, formerly of WMPM, reports that he has been doing quite a bit of traveling the past ten months aboard ships of Uncle Sam's Navy. CYC, a 1st lieutenant, is signal officer in charge of telephone, teletype and radio communications at an engineer depot. GJW is a lieutenant in the Medical Corps, on duty with the Fleet Marine Force. Let's have more reports. 73 — *Larry.*

EASTERN FLORIDA — Acting SCM, Frank C. Fassett, W4BYR — A Christmas card received from TZ indicates his present address is 59 Nottinghill Road, Brighton 35, Mass. HAD is still in Seattle awaiting orders to go north again. He states that Seattle WERS is getting off to a good start. DES is at Langley Field, Va., and writes that there are many hams in radar there. EYI says that EWS spent a short time at home with his family. DWU is at Georgia Tech. for more study. CWR has a new rating as chief radio in Coast Guard. Bing Crosby (LSPH) signed up with a ship repair unit as RT2c. FRE is on the last lap in radio school in Washington, D. C. Sandy Geer (LSPH) returned from Okla. on furlough recently and visited his parents in Tampa. He is now stationed at the U. of Miss. in ASTP. The Hillsborough County Defense Council has applied for renewal of WERS license WKPG. FSG writes that the WPB Detachment under Lt. Tony Litschaeur is making ready for 112-Mc. ground-to-plane operation and relay in conjunction with CAP. Fort Lauderdale and Lakeland detachments have each been recruited to five-man strength. There are six men at Winter Haven. All are equipped with Holliston ER-4 jobs. The Tampa unit has also received its Holliston ER-4s. Bartow is still in the process of organization. Plans are being made for detachments at Plant City and St. Petersburg. DVO is very busy. Pressure of business makes it necessary that this be your scribe's last report as Acting SCM for this section. Thanks to all those who have coöperated with me. Let's all get behind the new SCM and give him support. 73.

WESTERN FLORIDA — SCM, Oscar Cederstrom, W4AXP — Lt.(jg) A. P. Ludwig, ex-W6, was called to San Diego, Calif., because of the death of his brother. Kirk Beall, RM1c, came home because of the death of his father. GBM was painfully injured in a plane crash, but is able to be around again. Charlie Slattery, RM1c, spent Christmas at his home in Lowell, Mass. Hale Woolridge, RM3c, better known as Tex, was cheered at Christmas by her husband, who came over from Texas on his furlough from the Army. Tex says she is going to have a ham station after the war. Lt. Comdr. Hodge is a member of the Officers Glee Club of the Naval Air Station. Sally Walker, now an ensign, is back from officers training school in Mass. and is with the gang here at communication training. Mr. Hinshaw has been joined here by his wife who is a speaker of note. Mr. Hinshaw is a World War No. 1 veteran radio operator. FIO performs wedding ceremonies at odd times; he married two couples this month. AXP, jr., is mastering the code. The section received its first real snowfall since away back in the 1800s. School even turned out to see the unusual sight and to allow the kids to play at throwing snowballs. The OM sincerely hopes that you will have your every good wish in the coming year. 73 — *AXP, The Old Maestro.*

**(*Continued on page 80*)**

# QUALITY FIRST



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HAMMARLUND

(*Continued from page 78*)

GEORGIA — SCM, Ernest L. Morgan, W4FDJ — Augusta news: IAB visited FDX. ETW is railroading and IEB is drycleaning. HRR is a projectionist in a movie house. When last heard from AAY was in Alaska. FDX is an engineer with WRDW and has a Class A ticket on the strength of his commercial license. CYC is a 1st lieutenant in the engineers. I have a request for DXW's address, which reminds me that if you will let me know where you are you may hear more from the boys. 73 — *Pop.*

WEST INDIES — SCM, Mario de la Torre, CM2OP — Assistant SCM Puerto Rico-Virgin Islands, Everett Mayer, K4KD — The following hams are actively employed in various capacities by the FCC in Puerto Rico: K4HLP and K4KD are assistant monitoring officers; K4HHT and K4IFO are junior monitoring officers; K4HEB, K4KC and K4FAW are operators, and K4EZR is secretary. All are under civil service appointment.

### SOUTHWESTERN DIVISION

ARIZONA — SCM, Douglas Aitken, W6RWW — MLL reports their radio club is going full blast. The Nogales gang is to be congratulated on the way it has kept up ham doings during the blackout. IYZ was seen but not heard down around border points. KBJ is reported to be in the South Pacific. QJL has been home on leave and visited the gang. JRK is now attending OTS, aiming at a commission in the Air Corps. A nice note was received from GBN, but with the sad news that he had lost his wife last May. The Tucson Short Wave Assn. keeps up that fine training record, graduating twenty-one in Dec., mostly from the Army Air Base. They also had the fun of visiting one of the largest air fields and looking over some of the fine modern Army equipment. A card was received from RKL, who is still in Calif. TBR certainly keeps busy; besides caring for a husky family and raising pups on the side, she has taken on the job of den mother. SQN dropped over for a pleasant afternoon's ragchew. Hamming over the hill is completely out until the "go" signal from the FCC. GS is still at Marana and says the Army has been inspecting his rig with the possibility of purchase. A nice V-mail letter was received from QWG who is somewhere on the seven seas. I'd like to have cards from more of you, please! 73 — *Doug.*

### WEST GULF DIVISION

NEW MEXICO — SCM, J. G. Hancock, W5HJF — JWA is now RM2c, with hungry eyes on 1c. Upon a recent visit, JLJ and KCW were appointed to keep the SCM informed of what appears in *QST* and the SCM has to report each month after reading *QST*. It all happened because he had not noticed the FCC Order 115 concerning the extension of our operator licenses, and after being shown the spread in July *QST*, was his face red! JLJ is still up to his trading game. KCW has built a nice 2½-meter receiver. When an EC appointment was offered 3DPE (ex and future 5HAG) he left the state; he is now doing special research at the U. of Mich. and sends a nice report. HDH is now living at Colorado Springs, Colo., and has sold his rig to the U. of New Mex. GGX was married Aug. 21st. ENI had a nice thirty-day furlough at home. KKS is now in the Air Corps, stationed at Amarillo, Tex. Keep the reports coming in '44 like you did in '43. 73 — *Jake.*

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# The Month in Canada

### ALBERTA — VE4

From W. W. Butchart, 4LQ:

(*Aug.-Sept.*) 4AQG, Tommy McLaughlin, of Edmonton, has been working in Edmonton with CPA the past year, after spending some time with Prairie Airways, Regina, as mechanic. 4EW, Joe Summers, of Edmonton, has been out at Victoria, B. C., for a year now, running the Taylor and Pearson b.c. station there. 4ANR, Jim Miller, of Edmonton, is now with the RCN taking training in radio work at the U. of A. He left CPA to join up.

The death of Sgt. L. A. Appelt, 4AEZ, of Wetaskiwin, after a brief illness brings to an end the promising career of another popular young ham. To his wife and family, our sincere sympathy.

(*Continued on page 82*)

(*Continued from page 80*)

Well, 4AEV, Norm Lockhart, of Vulcan and Calgary, finally kicked through with a letter and some news on 4IN, Bill Lawrie, of High River. We have it on Norm's authority that Bill is a Sgt. WOG, stationed at a port on B. C.'s northern coast. Bill's home address now is 2340 Alma Road, Vancouver, B. C.

We received a letter from 4AOZ, Slim Marsden, of Milo, which was quite newsy. Of interest to all will be the fact that Slim's rig is doing noble service here on the home front. He loaned the heap (6J5–6L6G and pair of 607s p.p. final with 60 watts input) to the Alberta Government Forestry Service, after its rig at Rocky Mountain House was badly damaged by a bolt of lightning. Slim manages to keep pretty busy, what with work at his service station, radio service repairs, writing letters and sending cigarettes to local boys overseas in the services, so that spare time comes at quite a premium around the shack.

4APZ, Alvin Campbell, of Innisfail, managed to pick up a Meissener Traffic Master, so figures that he's all set to go! 4ASO, Lemore, of Purple Springs, has opened up a radio service shop in Taber.

Who among the VE4 hams hasn't heard or worked 5SO, Walt Joe, of Vernon, B. C., "where the big red apples grow!" either on phone or c.w.? Walt, a Chinese by birth, is just 100 per cent ham, and he has recently joined the RCAF as Wireless Operator, Air. He took his early training at Montreal, but a week or so ago he went West through Calgary, bound for posting on the West Coast at Vancouver.

4EA, Roy Usher, of Edmonton, as last reported, had just departed from Edmonton on his holidays, presumably to visit the Kootenay Valley or thereabouts, but, as we prophesied, Roy wandered a bit farther afield and turned up at Ft. St. James, B. C., where his brother 4ZP, Lorne Usher, of Edmonton, is located and working for CPA. Roy had the tough luck to have a breakdown with his car.

From 4HM, Chas. Harris, of Edmonton, comes word that 5FG, Doc. Hocking, of Prince George, now serving with the RCADC, has been posted to his home town, so Doc should feel pretty much at home.

Under new training orders for the Reserve Army in Alberta, 4BW, Ted Sacker, of Edmonton; 4HT, Fred Sterling, of Edmonton; 4XE, Dick Bannard, of Edmonton and 4LQ, Bill Butchart, of Edmonton, will be brought into closer contact. This is brought about by a combination of Regimental Signal Units with "E" Troop Cavalry Sigs (BW's outfit) for training one night per week. Looks interesting, as wireless work will be carried on.

4VJ, Ken Angus, of Edmonton, tells us that Paul Johnson, a young Edmontonian known to many of the local hams (though not a ham himself), who finished his Varsity course, then went to work at CBK, Watrous, and finally became a CBC technician, traveling around Canada at various times, has now turned up in Sicily, working as technician with CBC correspondent, Peter Sturzburg.

(*Nov.–Dec.*) It appears that the whereabouts of the 2nd op at 4ACF was incorrectly stated in this column some months ago, and for this error we are sincerely sorry. We had 4ACF junior, Colin Heseltine, of High River, at Kingston in the RCCS, but only a day or two ago we were talking to Colin's uncle here in Edmonton, and it appears that Colin has been studying law at the U. of A. for the last four years or so. We also learned that Colin, sr., is still at High River, and was up the Highwood on a fishing trip this summer.

And the day after our last report went forward to 2BE a newsy letter arrived from 4ZI, Elwood Irwin, of Barons. Herewith are ZI's comments:

"4AQP, Milson Hodgson, of Barons, passed the cigars around in the first week of September when his YF presented him with a son. (P.S. Didn't we promise some news from AQP soon? — *4LQ.*) 4WZ, John Row, of Barons, became a father the latter part of September. He came forward with a junior YL op to put through the ropes. Hi.

"4PZ, Vic Row, of Barons, in the RCAF, was home from Montreal for harvest. And was his bride glad to see him! She has gone to Montreal with him this time. (Maybe she saw some of those gals on the post cards PZ sent to some of the boys! — *4LQ.*) 4ADY, Laverne House, was back from the Vancouver shipyards with his XYL to help his father with harvest. Great news expected from the 'House household' any day now! 4ARC, Aylmer Gloer, spent a couple of weeks' holiday on a visiting and hunting trip to northern Alberta. He reports good luck.

(*Continued on page 84*)

"The difficult we do immediately, the impossible takes a little longer." —*Army Service Forces*


# *Electro-Voice* DIFFERENTIAL MICROPHONES

**Developed by our Engineering Department in close collaboration with the Fort Monmouth Signal Laboratories, and hailed as an accomplishment in the science of speech transmission, the *Differential Microphone* effectively shuts out all ambient noises and reverberation . . . permitting voice to come through clearly and distinctly . . . while rejecting the terrific din in tanks and the roar of gunfire.**

**In its present form, the *Differential Microphone* is produced as the T-45, a "Lip Mike," for use in battle by our Armed Forces and those of our Allies. Postwar developments will provide a variety of models with advantages that will be felt in many phases of civilian life.**

- Frequency response substantially flat from 200-4000 cps.
- Low harmonic distortion
- Cancellation of ambient noise, but normal response to user's voice
- Self-supporting, to free both hands of the operator
- Usable when gas mask, dust respirator or oxygen mask is required
- Uniform response in all positions
- Unaffected by temperature cycles from —40° F. to +185° F.
- Ability to withstand complete immersion in water
- Physical strength to withstand 10,000 drops
- Weight, including harness, cord and plug, less than 2 ounces

(*Continued from page 82*)

"The second op at 4OG, Gordon Gow (now Flt. Lt. Gow, M.B.E.) has arrived back in Canada from overseas with the RCAF. Gordy used to be with CJOC, and will be remembered by members of the S.A.R.C. for lectures on matching impedances and other items. His work overseas has taken him to England and West Africa. He has been giving instruction in the use of certain radio equipment aboard the huge Sunderland flying boats."

Thanks for the dope, Elwood. Your contributions are always very much appreciated as news from our southern Alberta friends is very spotty these days. As for ZI himself, he tells us that he has been having one devil of a time trying to make his junior op say "daddy" before she says "mama."

4EA, Roy Usher, of Edmonton has left CFRN to take up duties with CKUA, U. of A. b.c. station, where he will have charge of the technical end of operations. 4HM, Chas. Harris, of Edmonton, tells us that his daughter, Betty, with the WRCNS, has attained a code speed of 20 w.p.m. now. It looks as if HM will have a third op after the war! Of interest socially is the engagement of 4NU, Gordie Sadler, of Edmonton.

Edmonton is losing 4AJM, Rev. Harold Stibbards, who has accepted a call to a pastorate down East. We regret losing AJM as he was one of our more active hams. It was he who started our YL ops of 4WY, 4WE and 4WH into amateur radio by teaching them the code and preparing them for the examination for their tickets. We'll look forward to hearing you on with a VE3 call, Harold. In the meantime, best of luck and 73 from the VE4s!

The Edmonton *Journal* of October 22nd carried a write-up about our old friend 4AES, Père McGrane, of Lac La Biche. The Père has apparently forsaken the Cadet Corps, or transformed it into Sea Cadets, and now has the most northerly group in that organization. They are affiliated with the Edmonton Sea Cadet Unit. The newspaper noted that in addition to his clerical duties in the church, and his interest in the Sea Cadets, Père operated the projector in the local theater at Lac La Biche, printed a paper, and oversaw the affairs of the hospital. It also noted that in prewar days Père operated a "commercial" radio station!

And in a QSP via 4XE, Dick Bannard, of Edmonton, from 4VO, Dot Fitts, of Calgary, we get a little much needed news about some of the Calgary gang. Dot, who is operating the RCS station at Calgary, notes that she has just renewed her subscription to good old *QST*. Herewith a few remarks by Dot:

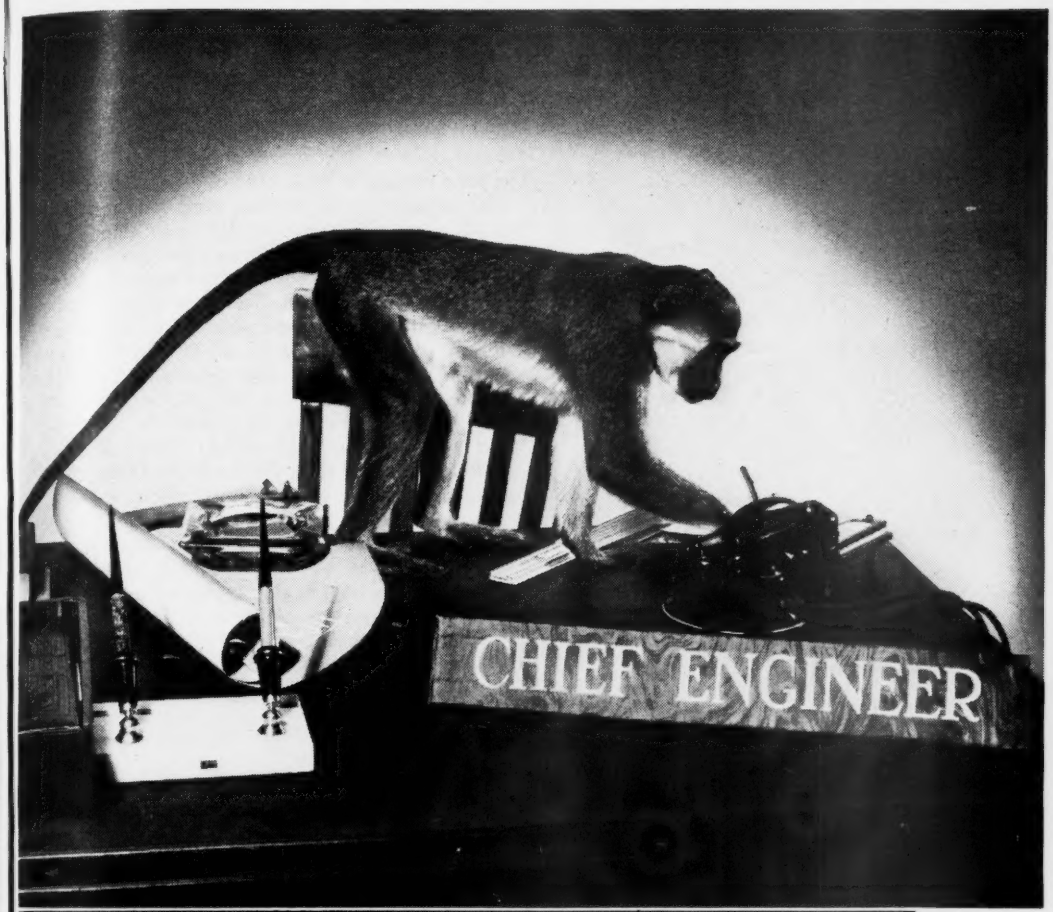
"4GD, Jim Smalley, of Calgary; 4PW, Sy Brown, of Calgary, and I, 4VO, took a trip out to Chancellor to visit Glen and Maudie Phillips, 4AHZ and 4APA respectively. Real purpose of the trip was a hunting trip for the men, so Maudie and I were left in town while the boys went shooting. We made some recordings to mail to hams in the States and overseas. We arrived back in Calgary at 3 A.M. with a duck, a pheasant, a home recording and pleasant memories of a swell time with some very swell people.

"4VN, E. L. Groves, of Lethbridge, recently married and will make his home in Calgary from now on. 4ABC, J. Romanchuck, of Calgary, recently returned from overseas, is getting married to a Calgary girl shortly. Tom Douglas (call unknown), of Calgary, is back from overseas and spends most of his time looking up people with spare gasoline coupons! Tsk! Tsk!

"4AAD, Jack Freeman, of Edmonton and Calgary, District Signals Officer for M.D. 13, has purchased himself a Super Sky-Rider, and now has it placed in his office with a sign 'DO NOT TOUCH' prominently displayed on it. (Could it be that AAD senses the presence of hams around the station? — *4LQ.*) I haven't been able to ascertain if the heap is screwed down to the table yet! 4AKB, Mel Riley, of Calgary, is back on holidays from the West Coast. 4ALX, G. S. Guerin, of Calgary, is now out at Strathmore operating the transmitters at CFCN."

Thanks, Dot, for the letter and the FB news. It's some time since we heard any news from Calgary, and your letter is all the more welcome for that reason.

4XE of Edmonton spent a few days down in Lethbridge working on an RCS project there. 4AOZ, Slim Marsden, of Milo, tells us that Tom Logan, 4ZF, of Edmonton, is instructing in wireless work at No. 2 Wireless School, RCAF, Calgary. 4CW, Ben Cool, of Calgary, has become interested in home movies and wants to sell his National NC100 receiver, says Slim, but the price is a bit too steep for him.




## he can do your work . . .

. . . *if* you are not really concerned about what happens to your designs after they leave the drafting board. And if the choice of electronic tubes and other components is left to chance, the performance of the finished product can scarcely measure up to the engineers' conception of it. Imagination is the well-spring of true progress in the field of electronics . . . but the performance of the most finely conceived design is no better than the tubes incorporated in it.

*T*he name Raytheon is synonymous with quality and dependability wherever tubes are in use. When production can again be directed to civilian use Raytheon tubes will be built better than ever before . . . *engineering* of Raytheon tubes will afford hitherto undreamed of new horizons for amateur, commercial and industrial radio.

FOUR "E" AWARDS FOR EXCELLENCE
*Each Division of Raytheon has been Awarded the Army and Navy "E"*

**RAYTHEON**

**RAYTHEON MANUFACTURING COMPANY**
***Waltham and Newton, Massachusetts***

DEVOTED TO RESEARCH AND THE MANUFACTURE OF TUBES FOR THE NEW ERA OF ELECTRONICS

## Correspondence

*(Continued from page 67)*

immediately. However, we hope to meet him again, either in VK or ZL, when things will be done! Hi!

I am pleased to state that in Australia we find that the hams are keener than ever, and that there exists a genuine desire for the friendship of all hams no matter what their nationality.

A few weeks ago W6MUO and I were privileged to see the New South Wales emergency radio network in operation and were impressed by the efficiency of the operators, all of whom are enthusiastic hams. Fellows like these hold the future of amateur radio in VK in their hands, and so far they have not forgotten that fact.

Through *QST* may I express my deepest gratitude to Loren E. Lippoldt for so generously furnishing my membership-subscription to *QST*. This gesture certainly is appreciated. . . . As W5IXT explained, ZL hams find it impossible to get subscriptions out of the country due to restrictions. The boys anxiously await the day when these restrictions will be lifted.

My home address is given above and I would be pleased if hams visiting New Zealand could look me up. For any encouragement required, read W5IXT's letter again!

— *James M. Strachan, ZL4AF*

---

### A GESTURE APPRECIATED

1668 7th St., Santa Monica, Calif.

Editor, *QST:*

As you will probably recall, as a result of the letter from C. E. Ballard, W5IXT, published in the July, 1943, issue of *QST*, I asked you to send a year's subscription to *QST* to each of the following: ZL4AF, ZL3CA, ZL3DJ, ZL3AZ and ZL1GU. The following letter is in reply to one of these subscriptions. . . .

"Dear OM:

"This letter is to express to you my sincere appreciation of your very fine gesture in entering a subscription to *QST* for me for the coming twelve months. This action on your part as a result of the letter which Chet Ballard wrote to *QST* is one of real ham spirit.

"I am at present in a military camp in New Zealand and have been for the past fifteen months. . . . My wife readdressed the copies of *QST* to me here. She also shares in my sentiments when I say a very hearty 'thank you, OM.' . . .

"We see many of your boys out here, but, to my regret, I do not seem to contact any of your hams. I do not have very much time out of working hours in the army and consequently perhaps cannot go about the right way in locating any hams that pass through. However, I must say that I enjoyed the evening with W5IXT and maybe we will meet some more of your hams in the very near future. . . .

"Well, OM, once again, thanks a lot for your kindness — you have no idea how welcome those


# He's Your Man!

If you're a manufacturer who uses electron tubes and components, your best friend today is your round-the-corner RCA Tube and Equipment Distributor.

His top job right now is locating needles in haystacks — the kind of needles *you* want in the haystacks *he* knows best.

Here are 4 vital wartime services he offers you:

**1—Local supplies**

**2—Technical "know how"**

**3—Quick delivery**

**4—Intelligent emergency expediting**

He probably has the part you need in his own stock today. If not, he's your one best bet when it comes to locating it to fill a rush priority order.

So, next time you need fast electronic help, try this formula: Look up your local distributor's number — pick up your phone — tell him what you need. If you don't have his name on file and can't find out who he is, write us and we'll let you know. RCA Victor Division, *Camden, N. J.*

RADIO CORPORATION OF AMERICA

*(Continued from page 88)*

*QST's* were, especially here in camp. I am already looking forward to next month, when another copy will be here. If there is anything I can do for you in this part of the world, please let me know and I will be pleased to do it if it is in my power. — Bob Stanton, ZL3AZ, 193 Ashgrove Ter., Christchurch, S.W. 1, N. Z."

I haven't heard from the other four fellows, but hope they are well and will be back on the air again when this mess is all over. . . .

— *L. E. Lippoldt*

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**THE SCR-299**

292nd Jt. Sig. Assault Co., Camp Pickett, Va.
Editor, *QST:*

I have just received my copy of *QST* [with] the article on the SCR-299. . . . You may picture my enthusiasm when I, as a radio amateur, was told to take over an SCR-299. It was my first introduction to the service. Mind you, I've never felt more at home than at that time.

I need not mention the capabilities of the SCR-299, for most hams know what it can do. I'd just like to state that it has been doing much more for us than it has for hamdom.

At first I was eager to introduce a few changes in the old BC-610 (HT-4), but after a second thought I reminded myself that those days are over, at least until we neutralize that parasite. However, I think some of the old gang must be tinkering at the Signal Corps Labs, for I've been noticing changes; changes that a ham would have made, to save time in construction, cost, etc.

So, laurels to the boys who make the 299.

— *John R. Krawczyk, W3JUO*

---

147–53 Sanford Ave., Flushing, N. Y.
Editor, *QST:*

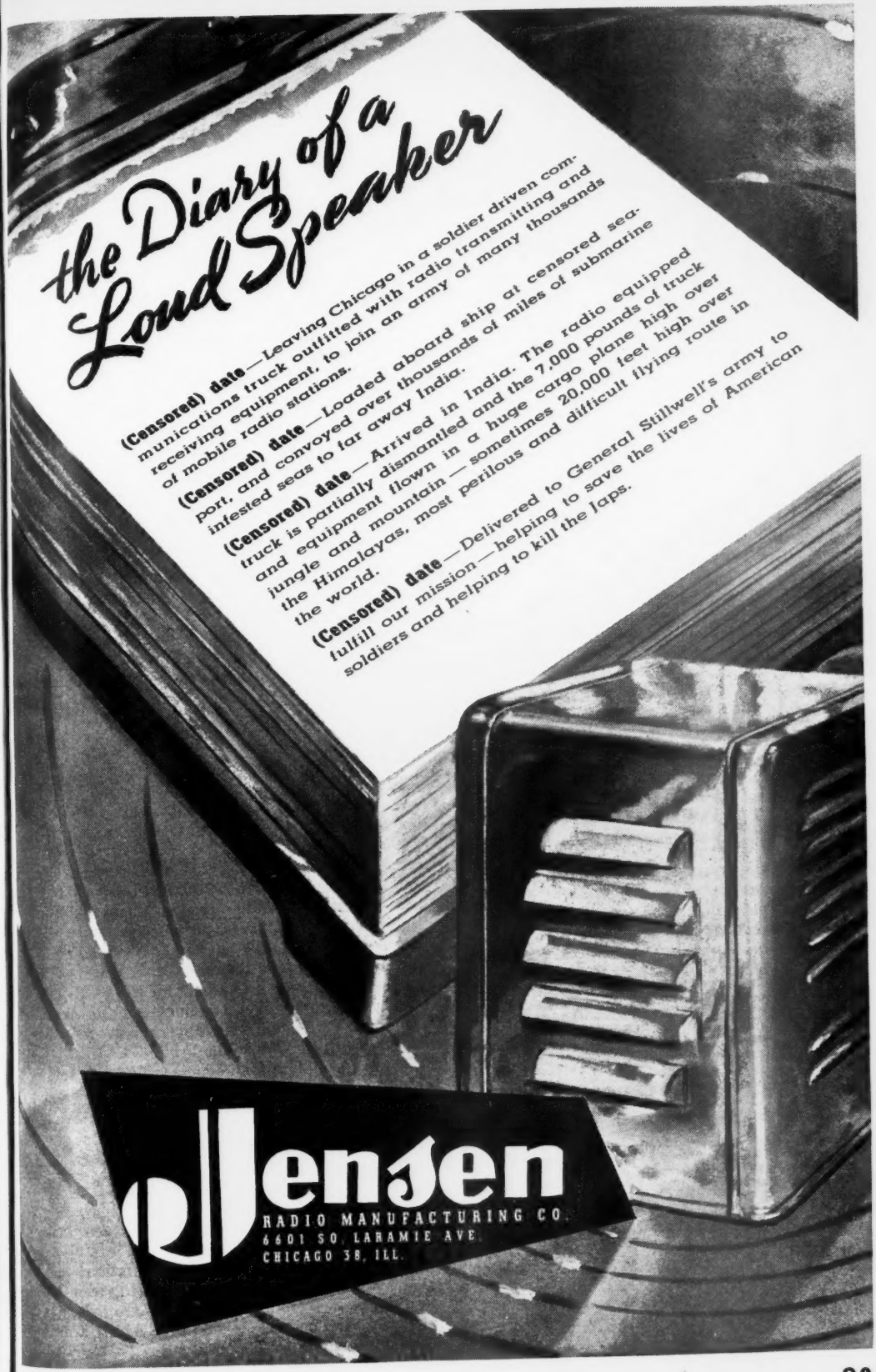
Cy Read's "The Saga of the 299," which appeared in the December issue of *QST*, was a glowing tribute both to ham radio and to the radio manufacturers. Without intending to detract from his tribute to the manufacturers, I'd like to give voice to something which Cy's article stirred up in my mind.

Cy made the statement: "When one considers the terrific pounding that such equipment takes, it might be assumed that considerable difficulty would be encountered from mechanical breakdowns — but such is not the case."

I take the liberty to assume that Cy meant *electrical*, as well as mechanical, breakdowns. As the old saying goes, "thereby hangs a tale."

The radio equipment being produced for our armed forces is built as solidly as the proverbial brick shanty we've all heard about. It is being built that way because the Signal Corps, the Bureau of Ships, the Bureau of Aeronautics, the Bureau of Ordnance and others insist that it be built to rigid specifications which they, and not the manufacturers, prescribe.

*(Continued on page 90)*


the Diary of a Loud Speaker
(Censored) date—Leaving Chicago in a soldier driven communications truck outfitted with radio transmitting and receiving equipment, to join an army of many thousands of mobile radio stations.
(Censored) date—Loaded aboard ship at censored seaport, and convoyed over thousands of miles of submarine infested seas to far away India.
(Censored) date—Arrived in India. The radio equipped truck is partially dismantled and the 7,000 pounds of truck and equipment flown in a huge cargo plane high over jungle and mountain—sometimes 20,000 feet high over the Himalayas, most perilous and difficult flying route in the world.
(Censored) date—Delivered to General Stillwell's army to fulfill our mission—helping to save the lives of American soldiers and helping to kill the Japs.
Jensen
RADIO MANUFACTURING CO.
6601 SO. LARAMIE AVE.
CHICAGO 38, ILL.

*(Continued from page 88)*

Those of us who are in touch with the radio manufacturing industry realize that fact, and so do the men who are using the equipment in the field. Let's give praise here to the engineers in the armed forces — at the Signal Corps Labs and at the Naval Research Lab — for insisting that what comes off the production lines is built to take it.

The radio manufacturers should take a hint from all of this. An enormous number of people in the armed forces and on the production lines are learning to know what good radio equipment is like. These same people are going to offer plenty of sales resistance if b.c. manufacturers attempt to revert to prewar practices of putting junk chassis inside handsome cabinets for sale to consumers after the war.

The amateur fraternity has always led the criticism of manufacturers in other days, and rightfully so, in most cases. This has had some effect, which should be encouraging, and with the added weight of the thousands who have learned something about radio manufacturing during the war, postwar construction practices should be improved.

Let's insist that improvements be made in keeping with the current state of the art. We don't expect to see BCL sets that could withstand the rigors of service on a PT boat or in a huge bomber, but we do want the manufacturers to keep up the good work and give us equipment that is built to meet something more than a price.

— *Richard M. Smith, W2FTX*

---

19 Drummond Pl., Red Bank, N. J.

Editor, *QST:*

Congratulations on keeping *QST* on the beam during these trying days. And three cheers for the FB articles on math.

One reason I'm writing this letter is regarding your article on the SCR-299. One of the cut labels mentions that a soldier has his hand on the "ignition switch." There is no such switch on the power unit, and the switch he has his hand on is the 110-volt overload breaker.

Otherwise, it was a fine plug for the SCR-299, which is, in my opinion, the finest set the Army has for use in the field. I have spent many months working with the 299 in the field.

Thanks a million for keeping a fine magazine going. . . .

— *Lt. Forest J. Pinkerton, W8QVL*

---

## MAKES HIM FEEL SO GOOD

Hq., Hq. Co. 94th RCN. Bn.,
Camp Chaffee, Arkansas

Editor, *QST:*

I would like to send my congratulations and best wishes to the gang at ARRL Hq. who are keeping up the good work while we are away. It always makes me feel so good each month to receive my copy of *QST*. . . .

— *Pvt. James Lee*


TANTALUM
(ATOMIC WEIGHT: 180.88)
IN MINERAL AND POWDERED FORM

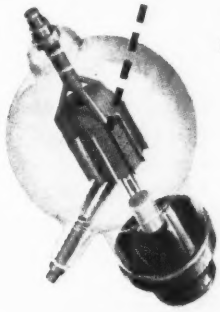
## MORE PRECIOUS THAN GOLD

Tantalum is one of the earth's rare and unique metals. Rare because it is mined in only a few spots in the world. Unique because it is the only metal that readily absorbs gases.

This ability of tantalum to soak up and retain gases—even while being subjected to intense heat—makes tantalum priceless in the manufacture of electron tubes.

Up until the time Heintz and Kaufman engineers built the first vacuum tubes with tantalum plates and grids, the electronics industry had to rely on chemical "getters" to absorb gases. These chemicals are not stable—the heat from an overloaded plate causes them to release gas suddenly, and the tube goes dead.

One of the reasons you will find so many Gammatrons in use where dependability is essential, is that all Gammatrons have tantalum plates and grids. They can and do take heavy overloads safely—punishment which would cause any other type of tube to cease functioning.



**HEINTZ AND KAUFMAN LTD.**
SOUTH SAN FRANCISCO • CALIFORNIA, U. S. A.

*Gammatron Tubes*

## On the Very Highs

*(Continued from page 43)*

decided to check through the list and see how many calls we could dig out of the roster of the company's field engineering staff. There are probably more, and this group is but one small segment of the total employed by this one concern, but it serves as another example of the part being played by the American amateur in his country's war effort. Of forty-odd field engineers, at least twenty-six are former active amateurs. They include **W1**AYG BWR CMU DFY HDQ HY KKL KTX MKT, **W3**EQQ FQY HJG, **W4**AEW CQA CXQ GKY HKP, **W6**DAS EJN JQ OJL OVK, **W7**ERW UB, W9ELQ, and ex-XU2MC.

These men are spread all over the world wherever the U. S. Navy has repair facilities. Your conductor has been doing a bit of traveling, too. Copy for September was prepared in Springfield, Mass.; that for November was done in Miami; December's was compiled in Boston; and we are putting the finishing touches on this in Key West, Florida. Apparently we are to remain in "the Southernmost City of the U.S.A." for several months this time; so, to get correspondence into our hands with a minimum of delay, make the address c/o La Concha Hotel, Key West, Fla., until further notice. For sea-going hams who may be in port, the working QTH is R.M.O., N.O.B., Key West.

## Radio Aids to Avigation

*(Continued from page 28)*

ing he follows the isopotential line determined by his altitude when passing over the outer marker.

Indications of both horizontal and vertical positions are combined in the instrument pictured in Fig. 7. The glide-path signal operates the horizontal pointer, which moves up and down in proportion to the received signal strength. In a similar manner the localizer signal operates the vertical pointer. The pilot maneuvers his plane so as to keep both pointers centered on the same spot.

The marker signals operate colored lamps on the pilot's instrument panel as he passes over each marker transmitter.

This instrument system provides an accurate means for guiding the pilot to a point sufficiently close to the ground to enable him to see the landing strip under most conditions.

### *Absolute Altimeters*

An absolute altimeter is an indicating instrument, calibrated in feet, which indicates the exact elevation of the airplane above the ground. Before this type of altimeter was developed the aneroid type was used to indicate the proximity of the terrain below the aircraft. This latter type consists of a pointer geared to an expansion chamber in such a way that changes in air press-

*(Continued on page 94)*

# "Tablecloth" *Communications*

Sportsmen will spot this application of communications as a mighty precious "stitch in time."

There are other applications that should start any red-blooded sports enthusiast doodlin' on the tablecloth or the back of an old cartridge box, that would have a happier end.

It might be used in the great north timberlands to aid in quickly notifying the crews of any jams that have slowed the sweep of their valuable timber to the mill.

Harvey-Wells has the equipment, technical and production ability to solve any of the many hundred applications possible with electronic communications; all they want to know is your pet problem.

*Why not send in your "Tablecloth doodlin's?"*

**HARVEY-WELLS** *Communications inc.*

★

HEADQUARTERS

*For Specialized Radio Communications Equipment*

SOUTHBRIDGE, MASS.

*(Continued from page 92)*

ure will cause corresponding changes in the position of the pointer on a calibrated scale. The accuracy of the device is limited; not only is it affected by temperature as well as by pressure, but also it does not read absolute altitude, indicating only the height in relation to some selected fixed level, such as sea level.

Several ideas have been brought forth designed to enable the pilot to determine his absolute altitude. One which showed some promise is that of using sound pulses emitted from an audio generator on the plane, recording the time consumed by the wave in traveling to the ground and echoing back to an indicating device on the plane. Besides being bulky and heavy, experience with this device has shown that it is not accurate at high air speeds and that its usefulness is limited to altitudes under 1000 feet.

Another type of absolute indicator developed to solve this problem is the capacity altimeter. Essentially this is a sensitive capacity-change indicator calibrated in feet. The two plates of the condenser are formed by the airplane and the ground directly under it. The practical application of this system also is limited, because the capacity changes very little after the separation between the plane and ground exceeds a few hundred feet.

### *Radio Altimeters*

Several types of radio altimeters have been devised and used experimentally during the past several years. In early types the intensity of a radio wave reflected from the earth was used as a measure of the distance between the airplane and ground. This led to errors because of the difference in ground characteristics as the location of the plane varied and because standing waves were set up between ground and plane which made signal-strength readings meaningless.

Present systems use microwaves to overcome some of these difficulties and to increase antenna efficiency. In one fairly recent development, a u.h.f. parallel-line f.m. oscillator-transmitter is used. Its frequency is varied by means of a motor-driven variable condenser connected across the oscillator circuit. A special antenna and receiver also are used.

The principle of operation involves consideration of the space between the plane and the ground as a two-wire transmission line with its end open. A voltage wave transmitted from the plane end will be reflected back from the ground. Since a certain amount of energy from the transmitter will go directly to the receiving antenna, the reflected voltage will vectorially add to or subtract from the direct energy. The resultant voltage for a given length of line (distance from plane to ground) will vary as a function of the frequency.

This can be explained in another way. The shorter the wavelength (the higher the frequency) the faster the frequency will vary in the vector

*(Continued on page 96)*

## RATING DATA

**Voltage and Wattage Ratings:—**

| | TYPE 1 Maximum Wattage Rating | R.M.S. Voltage Rating |
|---|---|---|
| **Resistance Value** | | based on wattage |
| Up to 1.9 megohms | 12 watts | 9 kv. max. |
| 2.0 to 10 megohms | 9 watts | 10 kv. max. |
| Above 10 megohms | based on voltage | |

| | TYPE 2 Maximum Wattage Rating | R.M.S. Voltage Rating |
|---|---|---|
| **Resistance Value** | | based on wattage |
| Up to 3.9 megohms | 22 watts | 15 kv. max. |
| 4.0 to 20 megohms | 15 watts | 20 kv. max. |
| Above 20 megohms | based on voltage | |

**Temperature Rating:—**
Maximum recommended hot spot temperature for continuous operation: 130°C (Ambient plus rise).
Maximum recommended ambient temperature for full wattage ratings: 70°C.

**Temperature Coefficient:—**
Approximately .04% per degree C between 20°C and 130°C.

**Resistance Tolerance:—**
Minimum acceptable tolerance ±10%.

**Construction:—**
(a) Hermetically-sealed to withstand salt water immersion tests.

(b) Designed to withstand aircraft vibration and 10g acceleration tests.

**A problem solved, designed, and produced in ninety days—and made possible by longstanding research and experience.**


**TYPE 1**
**5-9/32" x 1-1/16"**
**3600 ohms to**
**100 megohms**

**TYPE 2**
**9-25/32" x 1-1/16"**
**6800 ohms to**
**100 megohms**

# SPRAGUE MEG-O-MAX

## HIGH-RESISTANCE, HIGH-VOLTAGE RESISTORS

Less than 3 months from the presentation to Sprague Koolohm Resistor engineers of the problem of designing high-resistance value units capable of dissipating power at voltages up to 20 kv. and at high ambient temperatures, the first Sprague Meg-O-Max Resistors were on the job! Moreover, they used practically no critical materials, were of smaller physical size, and presented a degree of resistance stability and mechanical ruggedness not available in other units, exclusive of costly wire-wound meter-multiplier types!

Entirely unique in construction, Meg-O-Max Resistors are formed of a series of molded segments. These are joined non-inductively, and the assembly is then encased in a hermetically-sealed, rugged glass envelope provided with ferrule terminals to withstand aircraft vibration tests, salt water immersion tests, and tests for mechanical shock produced by rapid acceleration.

In addition to use as a high-voltage bleeder and as a broad accuracy meter multiplier for a voltage indicator, Meg-O-Max Resistors find many applications in measuring instruments, rectifier systems, high-voltage dividers, and as broad accuracy meter multipliers. Specify Meg-O-Max for High-Resistance—High-Voltage requirements.

Data sheets gladly sent upon request. Samples sent only on firm's request, giving details of application.

**SPRAGUE SPECIALTIES COMPANY**
**Resistor Division • North Adams, Mass.**

A NEW DEVELOPMENT BY THE MAKERS OF **KOOLOHM** INSULATED WIRE-WOUND RESISTORS
TRADEMARK REGISTERED

*(Continued from page 94)*

voltage at the receiver. The distance may be found by counting the number of voltage peaks as the transmitted frequency is swung from the lowest to the highest value.

The power output from the transmitter must remain constant, regardless of frequency, in order that the received vector voltage will not vary in amplitude, since this would produce error.

Antennas for this type of instrument are usually of the "T" type mounted in parabolic reflectors. Identical antennas are used both for transmitting and receiving, and they are often mounted with one under each wing. Simple collinear arrays mounted on the sides of the fuselage also are used sometimes.

The author does not believe that systems of this type will be used in the postwar period, since more highly accurate instruments have been developed recently in the science of distance and range detection. However, the usefulness of this arrangement is very good for altitudes below about 5000 feet, and it is particularly adaptable to instrument-landing problems.

## Topography and Propagation

*(Continued from page 19)*

lesia, it is now known that this condition can exist at various places all over the world. It received its name from the idea of the "Foe's beard," expressed in the Silesian dialect, as it is regarded as a forerunner of bad weather.

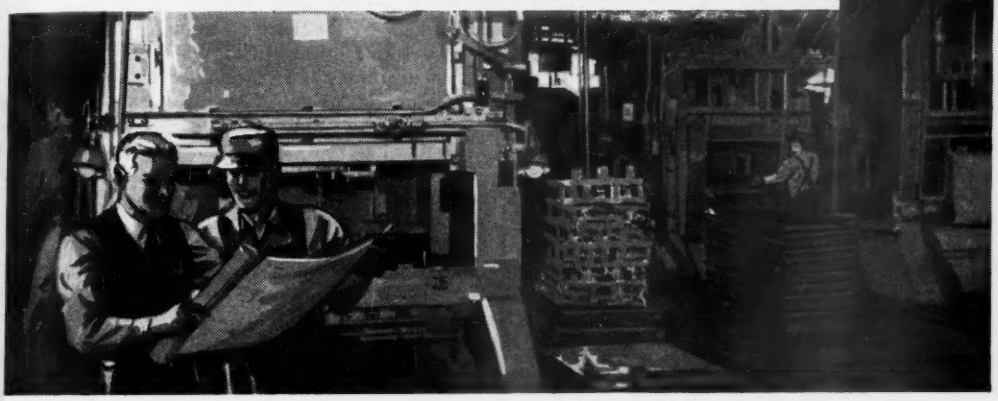
With a wind velocity of about 40 m.p.h., the usual lee eddy behind a mountain range, stretching out perpendicular to the wind, is not formed. Instead, there is a continuous strong downcurrent. Five miles farther back, however, a strong upcurrent exists. Behind the upcurrent field, downcurrents follow; then there is a new upcurrent, five miles distant from the first. Yet a third region of downcurrents and a third region of upcurrents appear again about five miles farther back. All are parallel with the mountain range. The fields of up- and downcurrent do not move with the wind, but are stationary. At great heights a huge isolated cirrus cloud caps the entire region. The general situation is suggested in Fig. 4. The formation of these large standing waves of alternating warm and colder air at periodic intervals may lend themselves to peculiar propagation effects for the very-high frequencies. So far as the writer knows there has been no investigation of the effect from this standpoint, but, since the effect has been observed at various points in the Blue Ridge mountains and at Mt. Washington Observatory, there exists an opportunity for doing so. Such an opportunity probably is present at other stations in this country.

Much remains to be learned concerning hitherto unexplained propagation effects for very short waves and many of the answers are to be found in the influence of topography not only upon the ground wave but upon the propagation

*(Continued on page 98)*

# OUT OF THE LABORATORY ...AND INTO PRODUCTION

## It Takes Volume Production to Make Research Effective



In war as in peace, the products of research become fully effective only when they can be put into mass production—*and put there fast!* This is a Delco Radio specialty. For years Delco Radio has been putting this know-how to work in the mass-manufacture of radios for leading makes of cars.

This experience is now being turned to meet the demands of wartime industry. Amazing new electronic devices—built to microscopically-close tolerances—are being manufactured in large quantity for the planes, ships and tanks of war. When the full details of this remarkable manufacturing story can be told, they will add another bright page in the history of Delco's leadership in "precision on a production basis."

Today—as never before—quantity and quality are needed vitally. Delco Radio is uniquely qualified to give both in full measure.

**Delco Radio**
DIVISION OF
GENERAL MOTORS

***BACK OUR BOYS BY BUYING BONDS***

*(Continued from page 96)*

in air masses as well. The knowledge that some of these effects are erratic and difficult of analysis will not deter the amateur. He has already demonstrated his interest in even such ephemeral conditions as the sporadic *E*-layer skip and the aurora skip, and he can be counted upon to further the progress of the art in a field which is peculiarly his own because of the disinterest of commercial engineers.

## With the CTC in England

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practice and made many friends among the workers. While there I volunteered for my share of fire watching and civil defense duties. In all I remained nearly a year at the factory.

Then I was called to my present position in a research establishment, where my chief value is my ability to make things out of odd bits and pieces, just like the old junk-box days of amateur radio. I don't do much inventing on my own — mostly building up trick gadgets that the scientists [censored] so it's much better than the factory. And my suggestions as to better ways to make things always get a sympathetic ear. At the factory, any deviation from the blueprint was won only at the cost of a great battle.

A good deal of the technical staff here consists of young fellows not long out of college — "public schools," as they're called in England. They seem to be a wide-awake lot. Only a few were hams before the war, and I get asked all sorts of questions about amateur work.

I guess that covers most all I dare write (and maybe more), and I hope it will be of some interest to the gang.

### *Correct Answers to Radio Historical Quiz Questions on Page 57*

1. Edouard Branley of Paris, in 1890.

2. That honor probably belongs to Guglielmo Marconi. He sent and received signals across his father's estate as a private experimenter at Bologna, Italy, in 1895.

3. Joseph Henry of Princeton, N. J., in 1831.

4. The first patent for a system of wireless telegraphy was granted on July 30, 1872, to Dr. Mahlon Loomis of Washington, D. C. His drawings illustrated how setting up "disturbances in the atmosphere" would cause electric waves to travel "through the atmosphere and ground."

5. Dr. James Clerk Maxwell of Cambridge University, in 1867.

6. Sir William Preece demonstrated that telephonic speech could be sent 440 yards by induction in 1885. In 1901 Professor Reginald Fessenden applied for a patent for radiotelephone transmitter utilizing a 50-kc. alternator.

7. Prof. Edwin H. Armstrong.

8. Prof. Edwin H. Armstrong.

9. Prof. Edwin H. Armstrong.

10. Thomas Edison, and it was called the "Edison Effect."

## The Army Airways Communications System

*(Continued from page 14)*

preliminary performance and general characteristics. A man who displays skill with tools and ingenuity in trouble-shooting naturally will be shunted into maintenance work. A convivial, sociable fellow who likes to chew the rag may be made an operator at a 'phone station, perhaps in a control tower. Still another lad who possesses musical ability, possibly somewhat more introspective and more given to solitude, will make a better c.w. operator.

No matter what the job, however, a high sense of responsibility and the utmost in perseverance and ingenuity are required. It is constantly borne in on the men that their job is not simply a matter of transcribing code on paper with a typewriter. In AACS it is not merely a question of routine handling of messages and placing them in a file. Particularly in the more remote stations, the traffic received calls for someone to take some action — and usually the fellow who has to take the action is the operator receiving the message. Many of the messages received are of the "do this" variety — such as lining up the ground crew for an incoming plane, seeing that flares are lit, calling out the crash crew when a damaged ship is about to attempt a landing, and so on.

### *Equipment*

So vast a program as AACS calls for substantial quantities not only of men but of equipment, as well. Some 5000 communications receivers — not a few which once graced ham shacks — are now in use at AACS stations, and about half that number of transmitters.

The equipment used at AACS stations is supplied by the Signal Airways Service of the Signal Corps, to specifications prepared by the technical staff of the Wing. About 90 per cent of the gear now used is of standardized design, and closely resembles similar apparatus developed for use by the domestic airlines and in allied services.

While it isn't possible at present to give detailed technical descriptions of this equipment, such descriptions would not be notably revealing if they could be given. The reason is simple — AACS equipment, so far as the actual radio transmitters and receivers are concerned, is reasonably orthodox in design and construction.

Transmitters are multi-channel crystal-controlled units capable of either A-1, A-2 or A-3 emission at the throw of a switch. The original 10-channel single-frequency transmitters with dial-type frequency selection which were formerly used now are largely being replaced by multi-channel transmitters in which output can be secured on all frequency channels simultaneously, the various final amplifiers being powered from a single power supply.

The receivers in use are principally Hammarlund Super Pros, with some National HROs and other types. Transmitters are of a variety of

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makes. The 200–400 watt 10-channel jobs mostly bear Collins nameplates, while the bulk of the 2- to 3-kilowatt rigs are made by Wilcox. Federal, Western Electric and Airadio transmitters also are used.

All transmitting and receiving equipment is mounted on standard 72-inch cabinet racks. Remote control is provided from the operating positions, commonly operated by dial-type automatic switching for frequency selection. Separate operating positions are provided for point-to-point and air-ground communications; this is true even in the smaller stations, where only one transmitter is available for use by both operators. "Simplex" operation — i.e., no break-in — is universally employed on manual circuits.

While the Signal Corps is responsible for major maintenance as well as installation of AACS equipment, anything short of major overhaul or rebuilding of apparatus is done by AACS radio mechanics at the station — or by the operator himself, if need be.

In the early days of AACS maintenance was perhaps the toughest problem of all, and the fact that this problem was so successfully met is another tribute to ham ingenuity and diligence — about which more in the next installment.

At present, with most stations equipped with rugged modern transmitters and receivers designed to withstand the most severe conditions, the problem has been somewhat mitigated. On the other hand the greater variety and intricacy of the newer equipment, particularly in the automatic stations, has made it necessary to adopt a vigorous preventive maintenance program.

The preventive maintenance program in the case of transmitters begins with daily visual inspections, meter readings, and dusting. A thorough check of all transmitter components is made each month. Antennas, frequency meters, emergency power units, power wiring and remote control lines are checked, cleaned, and, if necessary, serviced every week. Receivers are given a monthly tube check and visual inspection.

This system of frequent checks has been of great assistance in keeping AACS stations on the air, despite a lack of spare parts caused not only by shortages at supply depots but also by the remote locations of many of the stations and the difficulties of transport.

### *Organization*

There is, or course, no military organization anywhere without some red tape, but AACS comes close to approaching this ideal. Because of the variety of services rendered, the isolated nature of the commands and the varying conditions encountered, the organizational structure has been made as flexible as possible. In AACS the man on the scene is the man charged with the responsibility — and the authority — to do the job.

There are only two intermediate steps between the commander of a detachment — the lowest organizational unit, charged with the operation

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of an individual station — and AACS Wing Headquarters. The detachment may consist of only two men or of two hundred men — but the principle holds.

The first intermediate step is through the regional communications control officer, who is directly in charge of all stations in his region and whose responsibility is therefore very great indeed. He, in turn, if in a foreign theatre, is responsible to one of the six area control officers. These area officers are, however, primarily concerned with supervision, inspection and matters of general policy, and the main administrative burden rests on the shoulders of the regional commander. It is significant, therefore, that practically all of the regional control officers are radio amateurs — as were their predecessors, now advanced to even more responsible posts.

In his own sphere the detachment commander also plays a vitally important role — and here again the proportion of amateurs is large. Because of the small number of men required to operate the smaller AACS stations, many of the detachment commanders have only non-commissioned officer rank. The decentralized nature of the AACS organization often places a responsibility on these men quite out of proportion to their nominal rank.

Such a condition traditionally is designed to build resourcefulness and self-reliance. It is not surprising, therefore, that many of the commissioned officers in AACS came up through the ranks. In fact, practically all of the operating and technical officers in the Wing either joined as enlisted men and rose to the top or were commissioned direct from civilian life because of wide experience and exceptional qualifications in some field of radio — usually, of course, the amateur field.

Members of an AACS detachment live a life considerably different from that of the usual soldier — a life different even from that of the usual AAF specialist. While the detachment, because of its small size, usually is assigned to an air base for rations, quarters and administration, and is under the disciplinary control of the commanding officer of the base, neither commissioned nor enlisted personnel are usually assigned "overhead" tasks or post duty details. This is because AACS functions on a 24-hour basis, and ordinarily the personnel assigned to a station is not adequate to perform additional duties.

On the other hand, members of an AACS detachment in an isolated location, such as a remote weather base, may be required to do all their own housekeeping — even to providing their own mess.

In recognition of their technical qualifications, most AACS enlisted men are authorized at grades of corporal or higher. There are only a very few privates or even privates first class in the Wing, and the new men who enter at that grade don't remain there long — at least not if they're hams!

*(Part II of this article will appear in the March issue of* QST.)

## Splatter

*(Continued from page 8)*

**Sgt. Peter K. Onnigian, W6QEU,** (p. 24) started in radio back in 1933 as an economic measure. The family couldn't afford a radio receiver at the time, so he decided to build a crystal set. The fever resulting from this effort never subsided, and he received his ham operator's license in 1936 and a call, W6QEU, in 1938. He has entered many ARRL contests, in particular going all out for the Sweepstakes (fifth highest for 'phone in 1940, for example). He graduated from radio trade school in 1940 and worked for b.c. stations and commercial airlines as a radio engineer. Besides his Class A amateur ticket, he holds a radiotelephone first and radiotelegraph second. He was a civilian instructor of radio mechanics for the Signal Corps before induction into the Army Air Forces. Now he is teaching radio maintenance to enlisted men of his squadron, which furnishes both operators and maintenance men for the AACS. **B. Penners, W7HLV,** (p. 40) became interested in radio in 1931 while listening to a short-wave converter. At once he built up a one-tube regenerator — of which he says now that, if it hadn't worked, he probably would still be normal. As things turned out, it worked! W7HLV received his call in 1938 and, according to him, "it was granted by the FCC as a favor to the local R.I., to save him from having to examine said applicant again (after all, they didn't have W1AW code practice then!)." Thereafter he was content to be known as "that radio nut up the street" until the commercial bug bit him. Since then he has been an instructor in radio theory, a construction supervisor, and now chief engineer at KID and KNFB.

Also with us again are (p. 32) **Frederick A. Long, ex-W8NE, ex-W8BSL** (Splatter, p. 8, Oct., 1943, and p. 84, Nov., 1943), and (p. 54) **"Sourdough"** (Splatter, p. 66, May, 1943).

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### FEEDBACK

A LETTER from Philip Erhorn, W2LAH, concerning his article, "Notes on Inverse Feedback," in the June, 1943, issue:

"Although this is a late date to mention it, there are two diagrammatic errors in the article, both of which I believe are due to oversights on my part. Perhaps they might still be worth mentioning in the 'Feedback' column.

"Referring to Fig. 4 (p. 15), as the circuit is shown positive feed-back will take place. In order to correct this circuit, the feed-back loop must be tapped off one side of the secondary of the output transformer and the other side grounded. In this case the blocking condenser, $C$, may be eliminated. The transformer, $T$, supplies the additional 180 degrees phase reversal needed for *negative* feed-back. Fig. 7 (p. 17) also is incorrect, in that the variable resistor, $R_f$, should be inserted in series with $R_1$ to ground. The slider on $R_f$ then will allow adjustment of the feed-back voltage to the audio circuits."